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PYLOROPLASTY

WITH THE AFTER-HISTORIES OF FORTY-THREE CASES

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PYLOROPLASTY is an operation which has been rather unfortunate for it has suffered, on the one hand, from the too optimistic attitude of those who performed it in the early days of its history, and, on the other, from the too ready condemnation of those who so enthusiastically took up its rival — gastroenterostomy.

I hold no brief for this operation rather than any other of the excellent procedures in the domain of stomach surgery, but I do not care to see it fall into an undeserved oblivion, and my sole desire is to arrive at the truth as to its merits or otherwise.

The results of any operation can only be ascertained by a painstaking enquiry into the after-history of a considerable series of cases. In furtherance of this end I have traced (up to June, 1909) 43 cases[1] of pyloroplasty in which the original lesion was known and, as a result, I have been led to the conclusion that pyloroplasty, like gastroenterostomy, has a definite field of usefulness, and that when properly indicated its performance is attended by very good results.

In considering the results of operations on the stomach it is important that the classification of cases should be a pathological one, for it is on this that the end results so often depend. I have, therefore, divided the cases into the following groups:

Group 1. Pyloric stenosis without ulceration.
Group 2. Pyloric stenosis with ulceration.
Group 3. Ulcers not within pyloric zone.
Group 4. Duodenal ulcers.
Group 5. Hour-glass stomach.
Group 6. Pylorospasm.
Group 7. Cases in which no lesion could be demonstrated.

Group 1. Pyloric stenosis without ulceration. There were 13 cases. Four are dead: one, after 11 years, from double pneumonia; one, after 4 years, from acute appendicitis; one, after 3 years, from chronic nephritis; and one, after 2 years and 3 months, from tuberculous peritonitis. In none was there any recurrence of the stomach symptoms. Seven are alive and perfectly well. One is much improved. One has a recurrence of his stomach trouble.

The recurrent case is that of a man (J. P.), aged 31, operated upon in June, 1901, for a definite stenosis with much dilated stomach. He was absolutely well for three years when he began to complain of some return of his symptoms. He was then found to have chronic nephritis, and improvement followed medical treatment. As the symptoms were again very bad in 1906, gastroenterostomy was performed, but when the stomach was explored no recurrence of the stenosis and no ulceration was found. He has not been much benefited by this last operation, and it seems fair to conclude that his present condition is depending on the dyspepsia of chronic nephritis, and, as there is no recurrence of the stenosis, that the case is not really an operative failure.

[1] Six cases were operated upon by Finney's method and are all found in groups 4 and 7. In the remaining 37 cases the operation was that known as the Heineke-Mikulicz method.

Group 2. Pyloric stenosis with ulceration. There were 7 cases. Three are alive and perfectly well (operated upon 14, 13 and 9 years ago). Four have recurred. Of the recurrences:

1. This patient (W. L.), aged 38, was operated upon in March, 1897. There was an ulcer on the posterior wall of the pylorus. He was absolutely well until March, 1901, when he had a stomach attack, and since then he has gradually developed his old trouble with much pain and vomiting. In June, 1904, the abdomen was opened and an inflammatory mass found at the pylorus. Posterior gastroenterostomy resulted in a cure up to the present time, January, 1910.

2. A man (Mr. S.), aged 56, was operated upon in September, 1897, for pyloric ulcer and stenosis. He remained well for five years and then had a recurrence of his old troubles. In May, 1904, an inflammatory mass was found at the pylorus, and posterior gastroenterostomy was performed. Till August, 1909, the patient continued well.

3. This was a man (T. S.), aged 43, who was operated upon in June, 1900, when an ulcer was found on the stomach side of the pylorus. He remained perfectly well until March, 1905, when he had a recurrence of his symptoms. In June, 1905, a further operation disclosed a duodenal ulcer. The pylorus easily admitted two fingers. Posterior gastroenterostomy was followed by cure up to August, 1909.

4. A man (T. W. S.), aged 29, who had pyloroplasty performed in July, 1901. A deep ulcer was found on the stomach side of the pylorus. He was never quite well, and in January, 1902, posterior gastroenterostomy was performed. The pylorus would easily admit two fingers. He was known to be well until May, 1904.

Group 3. All ulcers away from the pylorus. There was only one case which recurred after the patient had remained absolutely well for a period of 6 years:

Miss R., aged 33, admitted for operation in August, 1900. For five years she had symptoms of chronic gastric ulcer and was unable to take solid food. The stomach was found thick-walled and there were signs of ulceration at the lesser curve, adherent to the pancreas. The pylorus only admitted the little finger. Pyloroplasty was performed and she made a complete but rather slow recovery and was able to eat anything until November, 1906, when she had so much stomach pain that she could not tolerate milk. Gastroenterostomy was performed, but the patient died comatose 48 hours after the operation. The postmortem showed a large chronic ulcer on the posterior wall of the stomach involving the pancreas. The pyloroplasty opening admitted three fingers easily.

In groups two and three it is striking to note that patients were cured for such long periods, for, in each case, it was the Heineke-Mikulicz operation that was carried out and no attempt was made to excise the ulcers. The explanation probably lies in the fact that the pylorus is in a condition of chronic spasm and that the relief afforded is similar to that obtained by dividing the sphincter in cases of anal ulceration.

This explanation was first suggested by Leonard Bidwell, so far as I am aware, who mentioned it in a paper on "Pyloroplasty for Cicatricial Contraction of the Pylorus and for Gastric Ulcer," British Medical Journal, October 6, 1900.

Though judging from the figures — 7 cases, 4 recurrences — active ulceration is a contraindication for pyloroplasty, nevertheless, some striking results have been obtained, as in the cases operated upon several years ago without recurrence. The following may be quoted as an illustration of the conditions that have been met by this operation:

The patient was a man of 21 whose illness began three years before his admission to the infirmary. His symptoms were typical of pyloric ulcer and he particularly complained of night pain. At the operation, performed by Mr. Rutherford Morison on May 31, 1900, the stomach was found moderately dilated. The pylorus was adherent to the gall-bladder; it felt very firm and was also fixed posteriorly to the head of the pancreas. The pylorus was tightly contracted and consisted of firm cicatricial tissue, which cut almost like cartilage. Just on the stomach side, and posteriorly, there was a deeply excavated ulcer which had infiltrated the pancreas. The ulcer was well swabbed out with iodoform gauze, a piece of the latter being left in situ. The incision for pyloroplasty was made fully three inches long and the operation completed after the Heineke-Mikulicz plan. Recovery was uneventful and the patient reported himself as absolutely well more than nine years after the operation.

It is impossible to say after what lapse of time cure may be considered to be established, but the longest interval known to me between operation and recurrence is seven years.

Group 4. Duodenal ulcer. There was only one case which was much improved.

Group 5. Hour-glass contraction. No case.

Group 6. Pylorospasm. In this condition the pylorus may look contracted from the outside, may be felt firmly contracted, and usually entirely fails to relax on handling. From the interior of the stomach such a

pylorus appears as a firm ring which will only admit the tip of the forefinger as the result of considerable pressure, and which contracts down on to the finger as the latter is withdrawn into the stomach, in contradistinction to the normal pylorus, which easily gives way before the examining finger. One of the best marked cases I ever saw was the following:

The patient was a woman of 30, admitted to the Newcastle Infirmary in 1907, complaining of frequent, sudden and severe attacks of pain in the upper abdomen, accompanied by vomiting and with great epigastric tenderness. These seizures had occurred during the preceding three years but they had become much more frequent — occurring every two weeks — during the month or two preceding admission. They exhibited a remarkable periodicity and the patient always knew when to expect them. On August 25th, being the day of an expected attack, the patient was suddenly seized with sudden and most acute pain in the upper abdomen so bad that she writhed in bed, vomited frequently and constantly shouted out. Morphia had to be given, so that when the patient was seen about an hour afterwards she was much better, the vomiting having ceased. The upper third of the right rectus muscle was exceedingly rigid and simulated a distended gall-bladder. A little later this rigidity had passed off and the patient said she was quite comfortable, and there was nothing further to be made out on physical examination. As the patient had experienced several of these attacks while in the hospital it was decided to operate, and this was carried out by Mr. Turner about six hours after the attack. A vertical incision was made through the right rectus muscle. The only abnormality discovered was a very tight contraction of the pylorus. Viewed from the outside it looked as if a Murphy's button was impacted at this spot, and, on feeling the stomach, the pyloric ring was so marked as to give the impression of the button felt through the stomach walls. There was no sign of any ulcer at the pylorus and no scar either there or in the pyloric portion of the stomach. The contraction of the pylorus did not disappear after handling and seemed just as marked at the end of the operation as at the commencement. Explored from the inside it felt exactly like the cervix and at first it was a little difficult to identify the aperture. When found, the latter would not admit even the tip of the finger until dilated and it required considerable force to enable it to be introduced up to the first interphalangeal joint. During withdrawal the finger was tightly gripped until only the extreme tip lay in the pyloric ring. No ulcer was felt and nothing found to account for the spasm. Posterior gastroenterostomy was performed by direct suture. The gall-bladder was normal in every way. At a later stage of the operation the appendix was removed through a small muscle-splitting incision. It was quite free from adhesions, but contained three hard enteroliths. The patient made a good recovery, leaving the hospital at the end of three weeks. She had no return of the pain, the day on which it was due having passed without incident. In response to my enquiries this patient wrote me in August, 1909, informing me that she was no better for the operation and that she had attacks of pain every two weeks as before. She was only able to take light food and was as much an invalid as ever. Unfortunately, I cannot persuade her to submit to a further operation, though I feel sure that pyloroplasty would probably put an end to her attacks.

In this group there were 5 cases; four are perfectly well, one is much improved. The patient, who is "much improved," was operated upon 11 years ago and in the intervals of "bilious attacks" is perfectly well.

Group 7. Cases in which no pathological lesion can be demonstrated. There were 16 cases. Two are perfectly well. One is much improved. Thirteen are no better. There are a comparatively large number of cases in this group, because in the past I commonly employed pyloroplasty as a means of finishing an operation which had simply been a negative exploration of the stomach.

Before concluding that all these cases were unsuitable for any form of surgical interference we must take into account the fact that many were operated upon in the days when I was not alive to the importance of searching for other sources of mischief, and it may be that in some gall-stones or appendicitis or pancreatic mischief may have been the source of the symptoms. One patient, who had a rapid recurrence, was subsequently (8 years later) admitted to the medical wards with locomotor ataxia. In no case were there troublesome symptoms that could be attributed to the operative interference, which is a comfort that would probably have been denied the surgeon who performed gastroenterostomy under such circumstances.

THE AFTER-HISTORY OF A CONSECUTIVE SERIES OF TWENTY CASES

In connection with this subject the continued observation of a consecutive series of cases over a period of fifteen years has proved most interesting and instructive.

In the Lancet for February 26, 1898, Mr. Rutherford Morison published a series

AFTER-HISTORY OF TWENTY CONSECUTIVE CASES OF PYLOROPLASTY (HEINEKE-MIKULICZ)

THE FIRST CASE OPERATED UPON 15 AND THE LAST 10 YEARS AGO

Lancet, February 26, 1898.				*British Medical Journal, October 19, 1901.*	*Lancet, February 11 and March 11, 1905.*	*Unpublished June, 1909.*	
No. Initial. Sex. Age. Condition Found. Date of Operation.	*General Condition before Operation. Weight.*	*Duration of Illness.*	*State of Health at Time of Publication.*	*State of Health at time of Publication.*	*State of Health at Time of Publication.*	*State of Health to Date.*	*Remarks.*
1. H. F. 48. Simple stenosis. October, 1894	Thin and ill; much pain and frequent vomiting. 5 st. 1 lb.	5 years	Perfectly well	Perfectly well	Perfectly well	Perfectly well	Now, 15 years after operation, the patient is exactly double her old weight.
2. M. F. 37. Stenosis and ulcer. October, 1895	Thin and ill; much pain and frequent vomiting. 8 st. 12 lbs.	8 years	Perfectly well	Fairly well	Perfectly well	Has symptoms of gall-stones.	
3. D. M. 31. Pyloric ulcer. January, 1896	Thin, with pain and frequent vomiting. 7 st. 6 lbs.	3 years	Perfectly well	Perfectly well	Perfectly well	Perfectly well	Has gained 2 st. 8 lbs.
4. H. M. 59. Pyloric ulcer. April, 1896			Died from stomach cancer six months later			Dead	
5. Mc. M. 32 Simple stenosis. August, 1896	Thin and ill; severe pain and frequent vomiting. 6 st. 4 lbs.	2 years	Perfectly well	Perfectly well	Perfectly well	Perfectly well	
6. A. M. 25. Simple stenosis. October, 1896	Very thin; severe pain and frequent vomiting. 6 st. 1 lb.	12 years	Perfectly well	Perfectly well	Perfectly well	Perfectly well	Has gained 3 st.
7. H. M. 56. Pyloric ulcer. December, 1896	Thin; severe pain; vomited twice. 8 st. 7 lbs.	15 years	Perfectly well	Died of phthisis 2 years and 4 mths. after operation; no return of stomach symptoms		Dead	
8. L. M. 38. Pyloric ulcer. March, 1897	Very thin, with severe pain and frequent vomiting. 7 st. 5 lbs.	6 years	Perfectly well	Perfectly well; has had one stomach attack	Recurrence in June, 1902. Posterior gastro-enterostomy June, 1904. Inflammatory mass at pylorus	Recurrence	Remains well after gastro-enterostomy.
9. D. M. 42. Pylorospasm. March, 1897	Thin; dull, heavy feeling after food, and frequent vomiting. 10 st. 5 lbs.	9 years	Fairly well	Keeps very well; has to be careful with diet	Fairly well	Perfectly well	
10. S. M. 56. Stenosis and ulcer. September, 1897	Very thin; constant pain—worse after food; vomiting. 8 st. 6 lbs.	1 year	Perfectly well	Perfectly well	Recurrence in March, 1902. Enterostomy showed inflammatory mass at pylorus	Recurrence	Remains well after gastro-enterostomy.
11. T. F. 39. Simple stenosis. September, 1897	Very thin, much pain and frequent vomiting. 8 st.	8 years	Perfectly well	Could not be traced	Fairly well	Perfectly well	Has gained 2 st. 1 lb.

AFTER-HISTORY OF TWENTY CONSECUTIVE CASES OF PYLOROPLASTY (*Continued*)

British Medical Journal, October 19, 1901.		*Lancet, February 11 and March 11, 1905.*	*Unpublished, June, 1909*	
No. Initial. Sex. Age. Condition Found. Date of Operation. State before Operation.	*State of Health at Time of Publication.*	*State of Health at Time of Publication.*	*State of Health to Date.*	*Remarks.*
12. S. F. 46. Simple stenosis. November, 1897. Thin, with pain and frequent vomiting. 2 years' duration.	Perfectly well	Perfectly well	Died of pneumonia in 1908. No stomach symptoms up to death	
13. D. M 23. Pylorospasm June, 1898. Very thin with pain and frequent vomiting. 7 st. 5 lbs. 6 years' duration.	Perfectly well	Perfectly well	Perfectly well	Has gained 1 st. 3 lbs.
14. S. M. 41. Pylorospasm. July, 1898. Very thin and with intense pain. 9 years' duration.	Perfectly well	Perfectly well	Has had some attacks of pain but is now much better	
15. T. F. 36. Pylorospasm. July, 1898. Very thin, with constant dyspepsia. 12 years' duration. 6 st. 2 lbs.	Slight indigestion at times	Still has bilious attacks	Still has bilious attacks, but is perfectly well in intervals	Has gained 3 st. 2 lbs.
16. H. F. 39. Simple stenosis. November 1898. Thin; constant dyspepsia and vomiting. 14 years. 6 st.	Health much improved	Fairly well	No stomach trouble, though still delicate	
17. H. M. 46. Simple stenosis. November, 1898. Pain and vomiting after food; had to give up his work. 7 years' duration. 11 st. 7 lbs.	Perfectly well	Perfectly well	Perfectly well	Has gained 3 st. 11 lbs.
18. W. F. 21. Pylorospasm. January, 1899. Severe stomach pain. 6 months' duration. 5 st.	Perfectly well	Could not be traced	Perfectly well	Has gained 2 st.
19. H. F. 45. No definite pathology. Frequent attacks of pain and vomiting. March, 1899. 2 years' duration. 6 st. 8½ lbs.	In poor health	Recurrence of symptoms but no stenosis. Anterior gastro-enterostomy. June, 1903. Well for six months then attacks as before	Recurrence	Now quite well
20. B. F. 36. Simple stenosis. May, 1899. Attacks of pain and vomiting. 4 years' duration. 6 st.	Perfectly well	Perfectly well	Perfectly well	Has gained 4 st. 3 lbs.

NOTE. — The cases are arranged strictly according to the date of the operation and not quite in the same order as when previously published. They can all be easily identified by means of the particulars given.

of eleven pyloroplasties, and in the British Medical Journal for October 19, 1901, he reported a further nine cases, bringing the number up to twenty. At that time I was able to furnish him with the after-history of each patient, and, at his request, I again, in 1905, obtained the after-histories of all but one, a case that I was then unable to find. This record was published in the Lancet for February 11th and March 11th of that year. In 1909, with Professor Morison's permission, I brought the work up to date, having the good fortune to find the lost case, so that I am now able to produce a table showing the after-history of every case in this consecutive series, the first of which was operated upon fifteen years ago and the last ten years ago:

Before analyzing this table it must be noted that all the cases are also included in the summary of the different groups, but it is on account of their continued observation that they are considered as a separate series.

Of the three recurrent cases, two suffered from active ulceration at the time of the operation, and in one no pathological condition was discovered.

Case No. 2 now complains of attacks which I confidently attribute to gall-stones.

Case No. 14 complains of occasional attacks of pain, for which he has been under observation, though nothing has been made out either to account for them or to encourage further operation.

No. 16 is perhaps the most grateful patient of the whole series. She is now, eleven years after the operation for stenosis, a woman of 50, and, though she still reports that she is delicate, her doctor says she continues to improve, and writes, "that her life has been converted from one of chronic invalidism to comparative good health."

There were two cases in the original list who died so soon after the operation from cancer and phthisis that they may be neglected for the present purpose.

We may therefore take it that there were eighteen cases, and of these, three have re-

curred and required secondary operations, and one patient has died eleven years after operation, but without any recurrence; so that there are 14 cases in good stomach health, and, I think, considering that all have been operated upon more than ten years, we may take it we have 83.3 per cent of cures. It will be interesting to see whether or not a consecutive series of gastro-enterostomies traced for so long will turn out as satisfactorily.

It ought scarcely be necessary to say that a return of abdominal symptoms does not always mean a recurrence of stomach mischief, and several cases have already been referred to bearing this out. So far as I am aware Professor F. Page of this city was the first surgeon in England to perform pyloroplasty, and I recently reopened the abdomen of a patient on whom he had operated eleven years previously. The pylorus easily admitted two fingers and there were no signs of gastric ulceration, but the patient harboured gall-stones, and by their removal she has been completely relieved of what was supposed to be a recurrence of her original stomach trouble.

THE INDICATIONS FOR PYLOROPLASTY

Simple, uncomplicated pyloric stenosis is, undoubtedly, the indication for this operation, but at the present time this is a rare disease. In the early days of the development of gastric surgery the cases that were submitted to operation were nearly all dilated stomachs due to pyloric stenosis in which the ulceration that had produced the condition was long since dead. Nowadays, the surgeon is called upon to relieve not the dilatation depending on stenosis but the active ulceration which precedes it, so that the scope of pyloroplasty has been limited by the march of surgical progress.

What then are the other uses of this operation? It may be a *means of dealing with a ruptured pyloric or duodenal ulcer*, a suggestion for which I am indebted to a paper by Alex. Miles, "Observations on Perforated Gastric and Duodenal Ulcer, Based on a Personal Experience of 46 Cases Operated Upon," Edin. Medical Journal, August and September, 1906.

An investigation which I made into the after-history of 48 patients operated upon for gastric and duodenal perforation, showed that in 38.8 per cent the accident of perforation did not cure the stomach symptoms, and, on enquiring more closely into the matter, those not cured nearly always presented a history of more or less chronic stomach trouble. This led me to make it a rule, whenever the condition of the patient permitted, to do more than merely close the ulcer in those who had a history of chronic stomach trouble preceding the accident of perforation.

In many cases this necessitates gastro-enterostomy, but in some it may be replaced by the simpler and quicker pyloroplasty. This operation enables one to deal with a simple stenosis, to excise a pyloric or duodenal ulcer, or so to close a perforation as to avoid the production of stenosis.

Suitable cases are those with small ulcers at the pylorus, or within an inch on either side and situated in the middle line, and without evidence of any more chronic ulcer on the opposite wall. If the pylorus will not easily lift up into the incision, such an ulcer probably exists, and the case is more suitable for gastro-enterostomy than pyloroplasty. The following case is a good example:

The patient was a man of 31, admitted to the Newcastle Infirmary in December, 1910. For fifteen months he had suffered from indigestion, with pain coming on three hours after food and relieved by taking more. There was no hæmatemesis or melæna. These symptoms varied from time to time and first led him to consult a doctor twelve months ago. For the three days preceding admission the pain was exceptionally severe. On the evening of admission he took tea at five o'clock and at nine was seized with the most violent pain, which doubled him up and made him sweat and vomit. When seen, four hours later, he looked exceedingly well and had a pulse of only 81, but there was board-like rigidity and marked tenderness of the whole of the right side of the abdomen. Mr. Turner operated four and one-half hours from the time of perforation. A median incision, from the ensiform to the umbilicus, gave a very good exposure. There was a small amount of clear fluid free in the peritoneal cavity. The region of the pylorus was covered by an œdematous fold of the round ligament, and when this was separated a perforation was seen about a quarter of an inch in diameter and exactly in the middle of the first part of the duodenum just beyond the pylorus. The

parts about the ulcer were thickened from œdema, but the pylorus could be easily lifted into the incision. It was decided to perform pyloroplasty, and an incision was carried from the ulcer for an inch and a half into the stomach, on the one hand, and into the duodenum on the other. This free exposure showed the ulcer to be of the chronic variety, with much thickening in the muscular wall. Either half of the ulcer was excised. On the inner wall of the duodenum exactly opposite that on the outer wall was a second ulcer, about half the size of the other, and apparently more recent in origin. The pylorus was thickened, but not markedly stenosed. Pyloroplasty was completed, and the abdomen irrigated and closed without drainage. Recovery was uninterrupted and ten months later the patient reported himself as entirely free from stomach trouble and able to take any kind of food without inconvenience.

It is also the *operation of choice in pylorospasm* when no definite cause can be discovered. In fact, when the pylorus is definitely and spasmodically contracted the addition of a simple pyloroplasty (Heineke-Mikulicz) will scarcely add to the risk, and it may save much disappointment, so that I would perform it even after removing a more distant, but possibly problematical, cause of the trouble.

I have found it *an exceedingly useful way of dealing with the contracted pylorus that is so often met with in cases of hour-glass stomach* the main lesion having been overcome by gastro-enterostomy.

And, lastly, time may show that *it is as likely to be curative in cases of ulcer of the body of the stomach* as gastro-enterostomy or excision.

Looking at the results in the light of these indications, we must exclude the cases in groups 2, 3, 4 and 7, which leaves 18 cases all operated upon more than five years ago, and with only one recurrence, a man whose symptoms are probably due to chronic kidney disease and in whose case it has been demonstrated that there is no recurrence of the stenosis. It is also significant that there are absolutely no ill effects which can be attributed to the operation, and that no case has been made worse by its performance.

A consideration of the mortality would not be profitable, for, so far as my experience goes, it has only occurred in cases associated with active ulcer, nearly always with a fixed pylorus and long-standing obstruction. With the general improvement in the technique of stomach operations, and with the clearer indications which we now recognize, pyloroplasty ought to have even a lower mortality than gastro-enterostomy.

Pyloroplasty has received the support of experimental investigation for Cannon and Blake in their "Researches on Gastro-enterostomy and Pyloroplasty" (Annals of Surgery, May, 1905), by the use of the Röntgen rays, have shown that one of the physiological objections at least is groundless.

It might be feared that by cutting the pyloric sphincter the digestive mechanisms controlling the exit of food would be destroyed, but their researches have shown that though the escape from the stomach begins earlier and continues in greater abundance than under normal conditions, the discharge into the intestine was not entirely uncontrolled, for the operation does not interfere with the process of rhythmic segmentation in the duodenum, and the contraction of the circular fibres (Ochsner's muscle) of the duodenum just beyond the stomach has been again and again observed. After pyloroplasty no regurgitation into the stomach occurs, or at least none that produces troublesome symptoms, for Finney says that Dr. Julius Friedenwald has investigated his cases and has found practically a return to the normal in all.

Regarding technique, it may not be out of place to say that the visceral incision should never be less than three inches with the centre at the pylorus, and that the extremities should be sutured first, thus avoiding the inversion of too great an amount of stomach or duodenal wall.

Any difficulty which the operation presents may be greatly lessened by mobilization of the duodenum. The thinness of the duodenal wall may be a revelation to those who are not accustomed to operate upon it.

So far as my experience goes, the Heineke-Mikulicz operation will fulfil all the indications and without fear of recurrence of the stenosis, but it may be that the new method of Finney will greatly increase the scope of direct operations on the pylorus.

ON THE LATE RESULTS OF OPERATIONS FOR PERFORATION OF GASTRIC OR DUODENAL ULCER

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At the present time, one of the most important questions concerning operative treatment in the case of perforation by gastric or duodenal ulcer is this: Whether, in cases of laparotomy for perforation, one should be content with suturing the perforation and treating the peritoneal cavity with either sponging or flushing, or whether one ought also to perform gastro-enterostomy, or even attempt to excise or resect the perforated ulcer with its frequently callous surrounding tissues. Judging from the literature of the subject, opinions on this point have been much divided during recent years, even among the most experienced gastric and abdominal surgeons, and reasons well worthy of attention have been adduced both for and against the advisability of gastro-enterostomy. In this much-disputed question, the greatest importance must naturally be given to the after-history of surviving cases of perforation which were operated in different ways.

In the literature, there is a good deal of scattered information as to the after-results in isolated cases of perforation. See, for example, Brunner,[1] whose cases, however, give a somewhat unreliable, or perhaps even incorrect, idea of the behavior, in the majority of cases, of gastric or duodenal ulcers or their symptoms after a successfully performed operation for perforation. The published cases in question, in fact, are, for pretty obvious reasons, more especially such as have, sooner or later after the perforation, shown continued or fresh symptoms of ulceration, and may even have required another laparotomy. The literature of the last few years, however, contains some, though very scanty, information of a more valuable kind concerning the after-results in whole series of cases of perforation. The scantiness of this information is most likely due to two main causes. In the first place, only within the last ten years have any great number of individuals survived perforation; and secondly, only the hospitals in the larger towns furnish any considerable number of cases. Patients in big towns are but little suitable for after-investigations. A large experience teaches us that there are very great or even insuperable difficulties in finding, after a year or two, any considerable percentage of those who belong to the fluctuating population of a large town.

The after-histories of a fairly long series of cases of perforation which I have come across in the literature to which I have had access I shall summarize as briefly as possible: English[2] found that of 17 cases treated with simple suture at the operation, 12 were quite well; 4 had later had gastric symptoms, and 1 had had abdominal trouble, which, however, was possibly of a gynecological nature (time of observation not reported). Of 35 cases of perforation whose after-histories were investigated by Paterson[3], 18 were perfectly well (in 2 of these cases gastro-enterostomy had been performed immediately); 14 had more or less severe dyspeptic troubles; in 2 cases gastro-enterostomy had to be performed later; and 1 died from a fresh perforation after nearly two years. French[4] has communicated the result of after-investigations in 18 cases, in 15 of which only suture was performed; in 3 excision of the ulcer. The period of observation ranges from 1½ to 8¾ years; 15 were able to continue their daily work and were free from gastric symptoms; 3 had considerable trouble, and had reduced working capacity. At the Upsala Surgical Clinic, Dahlgren[5] has investigated the after-histories of 10 cases (in 1 of which gastro-

[1] Deutsche Zeitschr. für Chir., bd lxix, 1903, s. 196–197.

[2] English: Remarks on Fifty Consecutive Cases of Perforated Gastric or Duodenal Ulcer. Lancet, 1903, ii.

[3] Paterson: Gastric Surgery, 1906, p. 81.

[4] French: The Subsequent Histories of Patients Who have Recovered after Operation for Perforated Gastric or Duodenal Ulcer. Guy's Hospital Reports, vol. lxi, 1907.

[5] K. Dahlgren: Beiträge zur Chirurgie des Magen- und Duodenalgeschwürs. Nord. Med. Arkiv, 1909.

enterostomy was performed) for a period of ½ to 7 years: 8 had no or insignificant gastric symptoms; 2 had chronic ulcer troubles. Information as to the after-histories in a smaller number of cases of perforation is given by Noetzel, Körte, Morton, Martens, Steinthal, Miller and Jopson (Philadelphia Academy of Surgery, April 3, 1911), etc.

These investigations of the after-histories of those who have survived operations for perforation show somewhat varied results; but they all indicate that the majority of ulcer cases have a favorable after-history, when operation for perforation has been performed successfully.

The reports, with the help of which I hope in this article to contribute toward clearing up the questions in hand, embrace 135 cases of perforated gastric or duodenal ulcer with acute peritonitis, which have all been operatively treated at South Swedish hospitals during the years 1894–1910. A great deal of this material comes from the surgical clinic at Lund. The other cases come from twelve country or town hospitals in the south of Sweden, and were intrusted to me for investigation and publication by the house surgeons at the several institutions. Of the 135 cases of perforation in question, 23 were certainly cases of perforated duodenal ulcer. Of these 135 patients, 71 were males and 64 females.

First, a few words in regard to the immediate results of operations in these 135 cases. Table A shows the cases divided into two groups — those in which at the laparotomy the perforation could be sutured and those where the perforation could not be closed.[1] In each group the cases are arranged according to the number of hours that elapsed between the perforation and the laparotomy.

This table shows, in the first place, that of the above mentioned 135 cases of perforation operated, 54 cases, that is to say 40 per cent, survived. Of the 92 cases where the laparotomy resulted in effecting suture, 50, that is to say 54 per cent, were saved, while only 4 cases, making 9 per cent, survived out of the 43 cases in which suture was not effected at the operation but only the peritoneal cavity drained. The table shows further, that during the first 12 hours after perforation 57 cases were operated with recovery in 32 cases (56 per cent); during the second 12 hours after perforation 35 cases were operated with recovery in 15 cases (43 per cent); after more than 24 hours after perforation 43 cases were operated with recovery in 7 cases (16 per cent).

TABLE A.—CLASSIFICATION OF 135 OPERATIONS

Time-interval between Perforation and Laparotomy.	Sutured.		Not sutured.	
	Number.	Healed.	Number.	Healed.
1 hour	2	1	..	..
2½ to 3 hours	3	2	1	..
3½ to 4 hours	4	3	..	..
4½ to 5 hours	7	6	2	1
5½ to 6 hours	5	3	3	..
6½ to 7 hours	2	2	..	..
7½ to 8 hours	8	4	1	..
8½ to 9 hours	2	2	1	..
9½ to 10 hours	5	2	1	..
10½ to 11 hours	1	1	..	..
11½ to 12 hours	8	5	1	..
12½ to 13 hours	4	3	2	..
13½ to 14 hours	5	3	..	..
14½ to 15 hours	2	2	1	..
15½ to 16 hours	2	..	1	..
17 to 18 hours	3	2	1	..
20 hours	2	2	2	1
21 hours	1	1	..	..
23 hours	4	..	..	..
24 hours	4	1	1	..
25 to 29 hours	6	1	1	..
30 to 34 hours	3	2	2	..
35 to 39 hours	3	..	2	..
40 to 47 hours	..	..	3	1
2 to 3 days	6	2	5	..
3 to 4 days	..	..	4	..
5 to 7 days	..	..	1	..
Over 1 week	..	..	7	1
	92	50	43	4

If we take into account *only the sutured* perforations, we find that of 47 cases operated during the first 12 hours, 31 survived (66 per cent); of 27 cases operated during the second 12 hours, 14 survived (52 per cent); of 18 cases operated 24–72 hours, 5 survived (28 per cent).

These figures confirm in a luminous way the fact maintained by many earlier writers, that *operation during the first twelve hours, possibly even during the second twelve hours, and complete suture of the perforation, are the chief conditions for a successful result of operations for perforated ulcer.* Of the cases thus operated at the South Swedish hospitals, indicated above, two-thirds recovered.

[1] That the cases within this group are relatively numerous would seem to be due to the fact that a considerable number date from the nineties, when ulcer perforations were often still incorrectly diagnosed as appendicitis-peritonitis, and accordingly the incision was directed toward the appendix.

We now pass to the after-history of the 53 individuals who survived.[1] By 52 of these a list of questions as to the after-history was answered, and in most cases fairly exact information has been received as regards the general health of the subject, history of later gastric symptoms, capacity for work, etc. Concerning one of the survivors (No. 44) no information could be obtained. Table B shows, in a concise way, all the most important data about these 53 cases taken from anamnesis and reports of operations and the results of investigation into the after-history of the patients.

This after-investigation shows, first and foremost, that of the 52 patients concerning whose late history information could be obtained all but two are still alive. One (No. 26) died 16 months afterward, of gangrene in the leg, while in the case of the other (No. 7) it is possible that the cause of death may have been connected with the gastric ulcer. In the 52 cases in question, 2 to 9 years have elapsed since the operation in 26 cases; 1 to 2 years have elapsed since the operation in 15 cases; and ½ to 1 year has elapsed since the operation in 11 cases.

As regards the ulcer symptoms during the time that elapsed after perforation, it appears from the after-investigations that of these 51 cases (there is no detailed information available about No. 7), 30 had very slight or no trouble from the ventricle; 14 had slight or moderate trouble (in some cases only temporarily); and, finally, 7 had considerable or severe ulcer troubles. If we take into account only the 26 cases which have had a period of observation since the perforation of at least two years, we find that 12 were free from symptoms, 10 had slight and 4 severe trouble. The results of these after-investigations thus show that *about half the ulcer patients who have successfully gone through an operation for perforation are after years quite well, fully capable of work, and practically free from gastric symptoms, and that only a small proportion of the remaining cases have later been subject to severe ulcer symptoms.*

We must now examine the cases a little more closely with reference to one or two special points of interest. Does this report tend to show that one can make any prognosis as to the future, from the symptoms of the ulcer case before perforation or from what is disclosed of the case by the operation (provided, of course, that the patient survives the peritonitis)?

In 13 of the cases in question (Nos. 1, 4, 10, 17, 18, 22, 23, 24, 25, 34, 35, 40, 51) the anamnesis informs us that the patients before perforation had either no symptoms at all or only on rare occasions; 11 of these 13 had in the period since the operation also been completely, or almost completely, free from symptoms. Only 1 (No. 24) has since had serious ulcer troubles, and 1 (No. 10) has had slight ones. Of 27 cases (Nos. 2, 3, 6, 11, 12, 13, 14, 15, 16, 19, 20, 27, 29, 30, 31, 32, 33, 36, 37, 42, 43, 45, 46, 48, 50, 52, 53) which the anamnesis expressly states have had intermittent or permanent gastric troubles for several or many years before the perforation, only 14 (Nos. 3, 11, 12, 14, 20, 31, 33, 36, 42, 43, 45, 48, 52, 53) have afterward been free, or nearly free, from gastric troubles, while the remaining 13 have subsequently had slight or rather severe symptoms — 3 of them (Nos. 2, 19, 46) despite the fact that previously, or at the laparotomy for perforation, they had had a gastro-enterostomy done. The figures are not large, but they show quite decisively that *an anamnesis without symptoms of ulcer gives a case of perforation a good prognosis for the future, while ulcer troubles of many years' standing in the anamnesis give a dubious prognosis.*

Is the position of the perforated ulcer in the ventricle of any significance for the later development of the case? In 18 of the cases included in this report (Nos. 1, 3, 5, 6, 8, 9, 10, 13, 14, 16, 19, 28, 29, 37, 39, 41, 50, 53) the perforated ulcer is stated to have been situated on the middle portion of the lesser curvature or on the anterior wall of the stomach. Only 7 of these cases (Nos. 1, 3, 14, 28, 39, 41, 53) — in 2 of which excision of the ulcer was performed — have had a

[1] In an earlier and more extensive treatise on ulcer perforation (written in German) the writer has already given the results of after-investigation in the cases of 30 of these patients. Bruns' Beiträge zur klin. Chir., lxxii, 1911. In one of these cases (No. 19 in Table B) perforation occurred on two different occasions and both times the operation was successfully performed. This accounts for the apparent discrepancy between the 54 successful operations and the 53 surviving individuals.

TABLE B—DETAILS OF 53 SURVIVING CASES

No.	Sex and Age.	Hospital. Date of Operation.	Earlier Symptoms of Gastric or Duodenal Ulcer.	Site of the Perforated Ulcer.	Operation.	Period of Observation after Operation.	After-History.
1	F. 26	Eksjö, 28/1, 1902	Acute abdominal symptoms 2 yrs. before	Lesser curvature?	Drainage of peritoneal cavity	6 yr. 11 mo.	Permanently free from gastric symptoms.
2	M. 41	Malmö, 2/1, 1903	Weak digestion for 20 years. Gastro-enterostomy performed 2/9, 1902	?	Drainage of peritoneal cavity	8 yr. 7 mo.	Serious ulcer troubles, with complete incapacity for work for long periods, repeatedly.
3	F. 30	Växiö, 18/2, 1903	Dyspeptic trouble for several years	Anterior wall of stomach	Suture of perforation	5 yr. 8 mo.	Almost free of symptoms.
4	M. 18	Malmö, 15/5, 1903.	Slight symptoms on two occasions	Duodenum	Suture of perforation	5 yr. 7 mo.	Completely free of symptoms.
5	M. 40	Växiö, 26/10, 1903	Eructations for some time before	Lesser curvature	Suture	5 yr.	Moderate gastric trouble as before operation.
6	F. 45	Lund, 7/12, 1903	Ulcer troubles for several years	Near lesser curvature	Suture	4 yr. 11 mo.	Slight ulcer trouble periodically; dieting necessary.
7	F. 24	Malmö, 28/6, 1904	Moderate gastric trouble periodically for several years	Anterior wall of stomach	Excision of ulcer	11 mos.	Died 11 months later of some illness of the digestive organs.
8	F. 20	Malmö, 18/9, 1904	Moderate ulcer symptoms the year before	Lesser curvature	Excision of ulcer	4 yr. 1 mo.	Slight ulcer trouble periodically; full capacity for work.
9	F. 45	Lund, 12/6, 1905	Moderate ulcer trouble	Anterior wall of stomach	Suture	4 yr. 6 mo.	Gastro-enterostomy 2 years afterward; serious gastric symptoms both before and after that; semi-invalid.
10	M. 58	Helsingborg, 3/8, 1905	Vomitings some time earlier	Lesser curvature	Excision	3 yr. 10 mo	Slight trouble at times; capable of work.
11	M. 43	Växiö, 5/2, 1906	Gastric trouble for a long time	Pylorus	Suture	4 yr. 4 mo.	Adhesions released 7 months later; afterward well and free from symptoms.
12	M. 51	Engelholm, 26/2, 1906	Digestive trouble for 5 or 6 years	Pylorus	Suture	3 yr. 9 mo.	Almost free from symptoms. Abdominal hernia.
13	F. 37	Kristianstad, 19/9, 1906	Ulcer symptoms for several years	Anterior wall of stomach	Excision	2 yr. 9 mo.	Moderate trouble; follows a mild diet.
14	M. 35	Lund, 25/11, 1906	Ulcer trouble for several years	Lesser curvature	Suture	3 yr. 1 mo.	Almost free from symptoms; full working capacity. Abdominal hernia.
15	F. 34	Norrköping, 14/12, 1906	Severe ulcer trouble at intervals for many years	Pylorus	Suture	2 yr. 10 mo.	Slight ulcer trouble at intervals.
16	F. 25	Lund, 2/4, 1907	Moderate ulcer trouble at times for several years	Anterior wall of stomach (Distinct hour-glass-stomach)	Suture	3 yr.	Serious ulcer trouble at times; reduced working capacity.
17	M. 36	Eksjö, 12/5, 1907	None	Fundus	Excision	2 yr. 5 mo.	Completely free from symptoms.
18	M. 44	Söderköping, 19/9, 1907	Slight gastric trouble at times two years ago	Cardia	Suture	1 yr. 11 mo.	Healthy and capable of work.
19	M. 37	Eksjö, (a) 7/10, 1907 (b) 8/7, 1908	Weak digestion at intervals for many years	(*a*) Anterior wall of stomach near greater curvature (*b*) Perforation by gastro-jejunal ulcer	(*a*) Excision and gastro-enterostomy retro-colic posterior (*b*) Excision	3 yr. 9 mo.	Moderate ulcer trouble occasionally somewhat reduced capacity for work.
20	F. 24	Växiö, 15/10, 1907	Gastric trouble for a long time	Pylorus	Suture	2 yr.	Inconsiderable trouble; mild diet; capable of work.
21	F. 34	Norrköping, 10/11, 1907	Gastric pains at times	?	Drainage of peritoneal cavity	2 yr.	Practically free of symptoms and fully capable of work.
22	M. 21	Lund, 30/5, 1908	None	Pylorus	Suture	3 yr. 1 mo.	Inconsiderable discomfort sometimes.
23	M. 62	Eksjö, 16/6, 1908	None	Duodenum	Excision and gastro-enterostomy and entero-anastomosis	3 yr.	No troubles.

TABLE B—DETAILS OF 53 SURVIVING CASES—CONTINUED

No.	Sex and Age	Hospital. Date of Operation.	Earlier Symptoms of Gastric or Duodenal Ulcer.	Site of the Perforated Ulcer.	Operation.	Period of Observation after Operation.	After-History.
24	M. 23	Lund, 28/7, 1908	None	Pylorus	Suture	3 yr. 1 mo.	Slight troubles; somewhat reduced capacity for work.
25	M. 22	Malmö, 2/11, 1908	None	Pylorus	Suture	9 mo.	Completely free from symptoms
26	M. 34	Karlshamn, 20/11, 1908	Ulcer symptoms during the preceding year	Pylorus	Suture	1 yr. 4 mo.	Serious ulcer trouble. Died in March, 1910, of gangræna cruris.
27	F. 26	Lund, 3/2, 1909	Ulcer trouble for several years	Pylorus	Suture	2 yr. 4 mo.	Slight gastric troubles; dieting necessary
28	F. 44	Eksjö, 7/2, 1909	?	Anterior wall, near lesser curvature	Excision	2 yr. 4 mo.	Practically well.
29	M. 24	Helsingborg, 3/4, 1909	Comparatively slight gastric trouble for a long while	Anterior of lesser curvature, near pylorus	Suture	2 yr. 2 mo.	Considerable ulcer trouble, severe at times.
30	M. 18	Malmö, 24/4, 1909	Slight trouble for several years	Near lesser curvature and pylorus	Suture	2 yr. 2 mo.	Moderate trouble at intervals.
31	M. 27	Vadstena, 10/7, 1909	Considerable dyspeptic trouble for 8–9 years	Anterior of duodenum	Suture and gastro-enterostomy antecolic anterior	1 yr. 11 mo.	Insignificant gastric symptoms; mild diet.
32	M. 27	Vadstena, 18/7, 1909	Dyspeptic trouble for 8–9 years	Duodenum	Suture and gastro-enterostomy	1 yr. 10 mo.	Considerable gastric trouble at times with reduced capacity for work.
33	M. 22	Lund, 1/8, 1909	Weak digestion for a long time	Pylorus	Suture	1 yr. 9 mo.	Entirely free from symptoms and fully capable of work.
34	F. 63	Växiö, 2/10, 1909	No gastric trouble before worth mentioning	?	Drainage of peritoneal cavity	1 yr. 8 mo.	Quite well.
35	M. 22	Malmö, 23/10, 1909	Black evacuations for six months previously; no other ulcer trouble worth mentioning	Duodenum	Suture	1 yr. 11 mo.	Practically free from symptoms.
36	F. 21	Jönköping, 17/12, 1909	Ulcer symptoms at times for several years	Anterior wall, near pylorus	Segmentary resection and gastrostomy	1 yr. 5 mo.	Posterior gastro-enterostomy and closure of gastric fistula performed 9/2, 1910. Since then quite well and free from symptoms.
37	M. 34	Malmö, 29/1, 1910	Considerable gastric trouble for two years	Anterior wall, near lesser curvature toward cardia (incipient hour-glass stomach)	Excision	1 yr. 5 mo.	Moderate trouble at intervals during the last 6 months.
38	F. 19	Jönköping, 12/2, 1910	Ulcer trouble for a year	Anterior of pylorus	Excision of the edge of the ulcer and gastrostomy	1 yr. 7 mo.	Posterior gastro-enterostomy performed 17/5, 1910. Slight gastric trouble at times; fully capable of work.
39	M. 16	Malmö, 3/3, 1910	Moderate gastric trouble for six months	Anterior wall, near lesser curvature	Excision. Later relaparotomy with release of adhesions (ileus)	1 yr. 3 mo.	Well and free from symptoms.
40	M. 37	Växiö, 7/3, 1910	Quite insignificant gastric trouble for six months	Lesser curvature, near pylorus	Suture	1 yr. 3 mo.	Quite well.
41	M. 28	Engelholm, 6/5, 1910	Periodical gastric trouble	Anterior wall, near lesser curvature	Suture	1 yr. 1 mo.	Except on two distant occasions, almost quite well and free from symptoms.
42	F. 45	Eksjö, 13/6, 1910	Ulcer symptoms for four years, even after excision of penetrating ulcer on anterior wall, 7/9, 1908	Middle of posterior wall of stomach, near greater curvature	Suture and gastro-enterostomy anterior and entero-anastomosis	1 yr. 1 mo.	Quite well.
43	F. 58	Kristianstad, 21/6, 1910	Trouble from gastric ulcer for ten years	Anterior toward cardia, near lesser curvature	Excision	1 yr. 3 mo.	Completely well and free from symptoms.

TABLE B—DETAILS OF 53 SURVIVING CASES—CONTINUED

No.	Sex and Age	Hospital. Date of Operation	Earlier Symptoms of Gastric or Duodenal Ulcer.	Site of the Perforated Ulcer.	Operation.	Period of Observation after Operation.	After-History.
44	M. 18	Jönköping, 13/8, 1910	Sour eructations at times for some years	Anterior of pylorus	Resection of pylorus [Billroth II]		No information received.
45	F. 27	Vadstena, 13/8, 1910	Symptoms of gastric ulcer for four years	Lesser curvature, quite close to cardia	Suture and gastro-enterostomy antecolic anterior	10 mo.	Well and free from symptoms.
46	M. 35	Helsingborg, 6/10, 1910	Weak digestion for many years	Anterior of pylorus	Suture	10 mo.	Continued gastric troubles: Gastro-enterostomy retrocolic posterior two months later. Since then also considerable ulcer trouble.
47	M. 68	Lund, 23/10, 1910	Slight gastric symptoms for 25 years	Pylorus	Suture	8 mo.	Practically free from symptoms.
48	M. 33	Malmö, 25/10, 1910	Moderate gastric trouble at times for seven years	Anterior of duodenum	Excision and gastro-enterostomy retrocolic posterior	8 mo.	Almost free from symptoms.
49	F. 21	Malmö, 4/11, 1910	Gastric trouble three years ago, and for a time recently	Posterior wall, near greater curvature, about the middle	Excision. Later relaparotomy with release of adhesions for ileus	7 mo.	Moderate trouble.
50	F. 20	Norrköping, 28/11, 1910	Considerable ulcer trouble for a long time	Anterior wall, well to the left	Excision of edge of ulcer and gastrostomy	7 mo.	Slight trouble.
51	M. 29	Malmö, 3/12, 1910	None	Anterior of duodenum	Suture	7 mo.	Quite well.
52	M. 32	Helsingborg, 4/12, 1910	Gastric trouble for many years	Anterior of pylorus	Suture	9 mo.	Practically free from symptoms.
53	M. 51	Norrköping, 31/12, 1910	Ulcer trouble for more than seven years	Lesser curvature	Suture and gastrostomy	6 mo.	Well and free from symptoms.

favorable after-course. Of 24 cases with perforation in or near the pylorus or in the duodenum, on the other hand, no fewer than 16 (Nos. 4, 11, 12, 20, 22, 23, 25, 31, 33, 35, 36, 40, 47, 48, 51, 52) — in 1 of which segmentary resection of the ulcer was performed and in 3 gastro-enterostomy — have afterward been wholly or almost free from symptoms, while 8 (Nos. 15, 24, 26, 27, 30, 32, 38, 46) — in 1 of which gastro-enterostomy was also performed — have had ulcer troubles. According to this report, therefore, *the after-results of suture of perforations situated in the neighborhood of the pylorus or in the duodenum are relatively favorable without gastro-enterostomy having been performed*, save in a few cases. This state of things seems to me distinctly surprising and noteworthy — all the more, as the closer study of the complete clinical history of the cases in question shows that the tissues surrounding the perforation were in many cases considerably infiltrated or callous, so that the pyloric opening after suturing and invagination had certainly not retained its normal width, but been more or less constricted. On the other hand, this result agrees very well with the data obtained by examining the anamnesis of the cases of perforation[1]; i. e., the cases which remain latent up to the moment of perforation are most frequently duodenal ulcers or gastric ulcers in the vicinity of the pylorus.

As appears from the above table, the majority of these surviving cases have had the perforation merely sutured and no further interference with the ventricle has taken place. In 11 of these cases, however, during the laparotomy for perforation excision of the

[1] See page 337 in Gustaf Petrén's "Ueber Perforation von Magen- und Duodenalgeschwüren." Bruns' Beiträge zur klinische Chirurg., bd. lxxii, 1911.

perforated ulcer, or at least of its margin, has been performed. Of these cases, only 4 (Nos. 17, 28, 39, 43) have since been well, while the remaining 7 have afterward had slight (Nos. 8, 10, 13, 38, 50) or moderate (Nos. 37, 49) gastric troubles. Of the 8 cases in which gastro-enterostomy has also been performed — in 7 cases during the laparotomy for perforation and in 1 case (No. 2) four months earlier — 4 (Nos. 23, 42, 45, 48) have been free from symptoms in the period since the operation, No. 31 afterward had inconsiderable, No. 32 considerable, and No. 2 serious ulcer troubles; No. 19 afterward had perforation of a gastro-jejunal ulcer in the gastro-enterostomy opening. In No. 36, segmentary ventricular resection was performed at the laparotomy for perforation; two months later it was thought advisable to have recourse to gastro-enterostomy. The cases now adduced in which excision has taken place or gastro-enterostomy has been supplemented by gastrorrhaphy can, therefore, scarcely be said to have furnished, broadly speaking, any particularly favorable after-course. They are too few, however, to allow of any very categorial conclusion.

The results supplied by these after-investigations tell very decidedly, in my opinion, against the propriety of complicating a laparotomy for perforation with a prophylactic gastro-enterostomy, without very special indications. In particular, these after-investigations indicate that for cases of perforation without ulcer troubles in the anamnesis a gastro-enterostomy is almost always unnecessary, and, further, that the site of perforation in the pylorus or in the duodenum only in case of evident stenosis indicates immediate gastro-enterostomy.

In 5 of the 53 surviving cases included in the foregoing report it has been found necessary afterward to subject the patient to a new laparotomy, No. 11 seven months afterward, when release of the adhesions was performed with good results; in 4 cases for gastro-enterostomy, after which No. 36 became free of symptoms, No. 38 continued to have slight gastric troubles, No. 46 considerable ones, and No. 9 serious ones.

An ulcer patient who has successfully recovered from a perforation should, in my opinion, continue to be treated like other cases of ulcer; that is to say, operated with either gastro-enterostomy or resection only on substantially the same indications as apply to gastric or duodenal ulcers in general.

THE HISTOLOGY AND NATURE OF THE SO-CALLED FOAM-CELL TUMORS[1]

With a Report of Four Cases of Endothelioma Xanthomatosum

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In recent years the study of the double-light refracting, fat-like substance in the tissues of the body has interested many investigators. Especially, the work of Kaiserling and Orgler, Stoerck, Löhlein, Schlagenhaufer, Adami and Aschoff, L. Pick, Munk, W. H. Schultze, Dietrich and others (1 to 13), has proven the important rôle of this substance in metabolism, and has shown its wide extent under physiological and pathological conditions. Various terms have been used to designate this double-light refracting substance, such as myelin, protargon, double-light refracting lipoid, and cholesterin fatty acid ester.

In a recent exhaustive study of this important subject, Kawamura (14), working in Aschoff's Institute, has shown that this double-light refracting lipoid is a definite compound, cholesterin ester or cholesterin fat, which can be separated from glycerine ester and the other lipoids by its reactions, color characteristics, and physical behavior.

Dunin-Karwicka (15) further emphasizes the nature and extent of this double-light refracting lipoid. Under physiological conditions, the suprarenal gland almost constantly shows the presence of cholesterin fat in the cortical cells. Less frequently, it is found in the ovary (lutein cells), testicle, thymus, hypophysis, thyroid, puerperal uterus and in the gall-bladder mucous membrane. Much greater is its pathological extent. In chronic nutritional disturbances, such as arteriosclerosis and chronic lung œdema, and in chronic inflammations, such as actinomycosis, gonorrhœa, chronic nephritis, staphylomycosis and chronic purulent salpingitis, this cholesterin fat is quite frequently present. In neoplasms such as "xanthomas," suprarenal adenomas, Grawitz tumors of the kidney, and in the tumor-like "xanthelasma," cholesterin fat is quite an important constituent. The presence of cholesterin fat, under pathological conditions, seems to be characteristic of chronic inflammations or chronic metabolic disturbances. It is never present in acute inflammations, according to Kawamura (14). It may be found in the secretions (prostatic secretion, sputum) or in the interstitial substance (atheroma of aorta, stroma of degenerating tumors), but it is generally found intracellular, either with or without signs of cellular degeneration. Gland cells, endothelial cells, connective tissue cells, wandering cells with one nucleus, plasma cells and glia cells may contain this cholesterin fat.

Such cells when filled with this fat and not showing any tendency to degeneration have a uniformly similar and extremely characteristic appearance. They appear as large, epithelial like, round, polyhedral or elongated cells. They may occur singly but usually appear in groups, strings or more seldom irregular masses. As a rule, there is but little interstitial tissue, frequently nothing more than a fine blood capillary framework, and as the cells grow they appear to become confluent as diffuse syncytia, containing many nuclei, in which the cell walls are not to be seen. The nucleus, small in relation to the cell, is from one to three times the diameter of a small lymphocyte. Usually there is a moderate, rather homogeneous chromatin content and a nucleolus. The cytoplasm in formalin-fixed, frozen, Sudan preparations seems to be made up of many yellowish-red globules. In alcohol-fixed preparations in which the fatty globules have been dissolved out, the cytoplasm appears light and granular, and on higher magnification, is seen to consist of many small meshes of apparently equal size, giving the characteristic appearance of foam. This typical foamy structure of the cytoplasm has, for instance, been found in

[1]From the Pathological Institute of the Städtische Krankenhaus am Friedrichshain, Berlin, Prof. Ludwig Pick, Director.

the outer zone of the three-zoned giant cell of Touton, sometimes seen in the parenchyma cells of the xanthoma of the dermatologists. L. Pick (7) has shown this foamy structure in these "xanthoma" and giant cells to be due to cholesterin fat. This foamy type of cell generally called "xanthoma cell" is not specific for xanthoma in all its varities, but occurs *wherever cholesterin fat is found totally filling the cell.* The name *foam cell* is perhaps a better general term. This foam cell seems to be characteristic, and with its presence we may assume its contents to be cholesterin fat.

The origin of this fat in the cell has been studied by L. Pick, who suggests that it may arise by: (1) Infiltration, (2) molecular (physical), and (3) chemical disturbance within the cell. The first of these possibilities is most important, as it has to do with "foam cells," which we are to consider.

These foam cells, although found in other conditions, occur in new growths and in tumor-like structures, which have usually been described under the somewhat confusing term of "xanthoma." Instead of this general term, we should classify growths of this sort, on account of clinical, macroscopic and microscopic differences, into: (1) *Infiltration structures* (not true new growths); (2) *true "foam-cell" new growths.*

Under the former we include tumor-like structures made up of foam cells, which are transitory, and which have a tendency to disappear either spontaneously or by therapy. They are generally associated with some metabolic disturbance, such as diabetes or icterus. L. Pick (8) has shown that they may be caused by an infiltration of cholesterin fat into the cell, as a result of a cholesteremia. These structures have been given various names, as symptomatic xanthoma (Pick, 8), xanthelasma (Aschoff, Kammer, 17), xanthoma tuberosum (Schultze, 12). Under this first class, also, may be included structures in which foam cells form in places where cholesterin fat collections are found free in the tissues with secondary phagocytic absorption by the adjacent cells (pseudoxanthoma of Pick and psendoxanthelasma of Aschoff and Kammer). This condition may be illustrated by the examples of cholesterin fat absorption in the pyogenic membrane in chronic purulent inflammation, as described by Pick (6), in old pus tubes and in old appendix abscesses; in chronic gall-bladder inflammation (Aschoff, 5); in dermoid cysts (L. Pick and Gentili, Maresch) which contained fat under pressure; and in many degenerating tumors, such as carcinomas and sarcomas which show cholesterin fat, free in the stroma, with secondary absorption by the cells.

Under the second class we have to consider "xanthomas" in the sense of true new growths. These foam-cell new growths may appear as local, yellowish-white tumors, such as those seen on the eye lid, composed almost exclusively of foam cells which show no tendency to decay or regress. Although they appear independent of any internal disease, their acceptance as true new formations is questioned by some observers.

The more important growths of this class are those true tumors usually classified as endotheliomas, fibromas, or sarcomas, which are modified by the general transformation of the tumor cells into foam cells. Such tumors have been designated by some writers as "fibroxanthomas," or "sarcoxanthomas"; but L. Pick (7) does not consider them a union or mixing of two equivalent tumors, and suggests that their nature is best expressed by the attributory terms fibroma, sarcoma, or endothelioma *xanthomatosum.* They are the "xanthoma en tumeurs" of the French.[1]

This ability of the cells of new growths to become thus infiltrated with cholesterin fat as a consequence of metabolic change without signs of degeneration, appears to belong exclusively to the connective tissue-endothelial group of tumors. Foam cells, however, may appear in neoplasms, the mother cells of which physiologically contain cholesterin fat, as, for example, tumors of the suprarenal, reported by Kaiserling and Orgler (1) and probably the carcinoma of the prostate, mentioned by Schlagenhaufer (3). Moreover, cholesterin fat may be set free by degeneration of the neoplastic cells and may infiltrate the

[1] We may be able, shortly, to characterize these foam-cell tumors as neoplasms which store up cholesterin fat in the same way that some tumors store up glycogen.

stroma (psendoxanthoma), as in the case of a necrotic gall-bladder carcinoma reported by Kawamura (14).

We wish in this paper to especially call attention to that group of true tumors, *xanthoma en tumeurs*, where all the tumor cells, or a part of them, have been transformed into foam cells containing double-light refracting cholesterin fat, without signs of degeneration. We have been unable to find any reference in which these foam-cell tumors have been circumscribed as a peculiar group of neoplasms.

The first tumor of this sort to be described was a new growth of the thigh, which, on account of the characteristic "foamy" appearance of the cells of the neoplasm, was termed by Sick (16) a "Schaumzellentumor."

Among other tumors of this class that have been reported, may be mentioned a case of "giant-celled xanthosarcoma," described by Kammer (17). This tumor was attached to a tendon of the finger and showed the presence of foam cells among the spindle cells. This author also reports another tumor, probably arising from a tendon of the toe. The foam cells were present in both cases without any signs of degeneration. Beneke (18) mentions a case of "sarcomatous degenerating xanthoma" of the foot. Darier (19) reports a "rhabdomyoma xanthomatosum" of the tongue.[1]

Proescher and Meredith (20) have described a case of "multiple myxo-cholesto-lipomata," with tumors occurring in the subcutaneous and subserous tissues. The first tumor originated from the *intermuscular fascia* of the calf of the right leg. Later, tumors developed in the other subcutaneous areas, in the breast, in the retroperitoneal tissue about the colon, in the subpleural tissue, in the lung, and on the surface of the liver. They were able to show that certain cells contained much double-light refracting lipoid substance. In the alcohol preparations, typical foam cells were seen in the places corresponding to the double-light refracting areas.

All of these cases *showed the presence of foam cells* in the new growth without signs of degeneration. They are all nothing else but real xanthomatous new formations.

As may be seen by these cases, xanthomatous changed neoplasms may be found in very different localities, such as on the fascia, the tendons, or the tongue. In addition, L. Pick (7) has mentioned foam-cell tumors of the skin, as well as of the tongue and parotid gland.

We wish to give a more exact description of those foam-cell tumors mentioned by L. Pick, and to report a case from a hitherto undescribed location, namely, the dura mater. Part of the material from these cases was hardened in alcohol, hence the cholesterin fat itself could not be shown in the foam cells; however, it was shown in a very convincing manner in case 4.

CASE 1. Man, with a firm hazelnut-size ulcerating tumor on one side of the tongue. A diagnostic excision was made and later the entire tumor, with some of the adjacent tongue tissue, was removed. (Operation by Dr. Max Litthauer, Berlin.) No relapse. The specimen was hardened in eighty per cent and absolute alcohol. Frozen, celloidin and paraffin sections were stained with hæmatoxylin and eosin, Van Gieson's stain and Weigert's stain for elastic fibers. Sections, which include the mucous membrane of the tongue, show at one place a small ulceration on the surface. The ulcer is hæmorrhagic, the pavement cells are wanting, and the adjacent stroma and submucosa are much infiltrated with lymphocytes and pus cells. The stroma shows some connective tissue proliferation in the submucous fat. The tumor is seen in some places in the mucosa and submucosa, but the chief part of the new growth is found in the muscular substance of the organ.

In the submucosa the tumor appears in small, round or oblong nests and clumps of pale cells strewn irregularly among the connective tissue fascicles. In some areas the clumps are so close together that only small septa of connective tissue separate them. At one place, these tumor cells extend to the mucosa. A papilla is seen apparently composed exclusively of these cells. No inflammatory signs are seen, except near the described ulcerated area. Two points are characteristic in these cells. The cells are very inexactly defined from each other, and the cytoplasm shows an absolutely uniformly similar structure. They are large, granular and pale, and, on account of their inexact limits, appear as bluish stained syncytia, about fifty microns wide. The nuclei are round, oblong, or polyhedral, not rich in chromatin, and frequently contain a nucleolus. The nucleus is sharply defined from the cytoplasm. By higher magnification the cytoplasm is seen to be a regular-meshed structure

[1] This designation which supposes a proliferation of the muscle fibres is misleading (See case 1, below).

Fig. 1. Ocular 2. Oil immersion $\frac{1}{12}$. Tongue tumor. Cross-section of the striped muscle fibers and foam cells. fc., foam cells; str., stroma; m., muscle.

Fig. 2. Ocular 2. Oil immersion $\frac{1}{12}$. Muscle bundles and foam cells (syncytia) cut longitudinally. fc., foam cells; str., stroma; m., muscle.

like foam (Figs. 1 and 2, fc.). The meshes appear to be of a uniform size. So the cells are typical foam cells.

In the muscular part of the tongue, the tumor cells are found in clumps in the connective tissue stroma and in the endomysium, between the muscle fibers, and compressing the muscle fibers themselves (Figs. 1 and 2, str., m.). The foam cells are the apparent syncytia (Figs. 1 and 2, fc.), arranged following the course of the muscle fibers which have atrophied. Various degrees of muscle fiber compression are shown. In some areas, only a few pink muscle cells are seen, the rest of the bundle being made up of grayish-blue, foamy syncytia. In the longitudinally cut bundles (Fig. 2), long, foamy syncytia, containing many nuclei, are seen between the muscle fibers. No cell wall can be made out, but the syncytial masses are sharply defined. The endomysium about the foam-cell structure seems unchanged and shows no reaction. In some areas the foam cells and the muscle cells seem to blend into each other. One could very easily think the muscle fibers have been transformed into foam cells. The picture is everywhere the same. No retrograde metamorphosis of the cells is seen. The structure is very similar to Sick's tumor (16).

CASE 2. Woman, 28 years old. Patient had a slow-growing tumor on the left labium majus of the vulva for four years. It was first noticed by a masseuse. During the last year the tumor grew more rapidly. A profuse vaginal discharge was present. General examination, negative. Female organs: vagina, medium volume; old rupture of the perineum 2 cm. long; adnexa, free. A flat, oblong tumor was seen. localized on the lower part of the left labium majus, with its long axis parallel to the long axis of the labium. The tumor, which was about the size of a half-dollar, could be lifted up with the skin. It was rather prominent and had a large base. The surface was smooth, grayish yellow and shining. There were no signs of inflammation and no pain. Operation: The cervix was amputated and the tumor with the surrounding skin was removed by Dr. Theodore Landau, Berlin.

Frozen sections and alcohol-fixed material embedded in celloidin and paraffin were studied. The sections were stained with hæmatoxylin and eosin, Weigert's elastic tissue stain, and alum-carmin. The whole thickness of the tumor was examined. The pavement squamous epithelium shows much pigment. The superficial layers of the corium are free. The sweat glands are normal. In the deepest layers of the corium, but more especially in the subcutaneous tissue, the tumor is seen. It is never near the epithelium. The interstices of the connective tissue are filled with large numbers of typical foam cells. In some areas these foam cells are in round or oblong clumps, sharply distinguished from the surrounding tissue. These clumps under the low power remind one of giant cells. The cell walls are not seen in the masses. The stroma is far in excess of the foam cells in this region. In the deeper area the foam cells predominate the field. They are seen in large syncytia, 30 to 40 microns wide with a very small amount of fibrous stroma between (Fig. 3, fc., str.). The nuclei are round or olbong, mostly central, fairly rich in chromatin and sometimes contain a nucleolus. Toward the edge of the tumor, large round isolated foam cells appear. They have a single nucleus containing a nucleolus. The cytoplasm here, as in the clumps, shows the characteristic foamy structure. The Weigert preparations show many elastic fibers in the stroma. In some areas the elastic fiber bundles seem to be the only

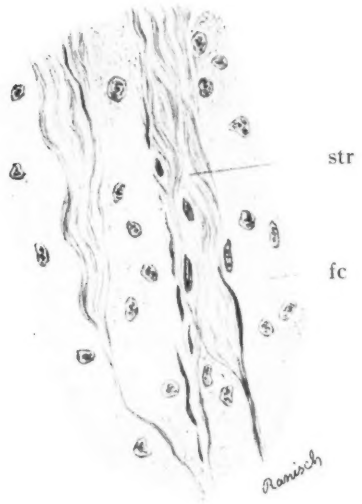

Fig. 3. Ocular 2. Oil immersion $\frac{1}{12}$. Tumor of the labium majus. fc., foam cells; str., stroma.

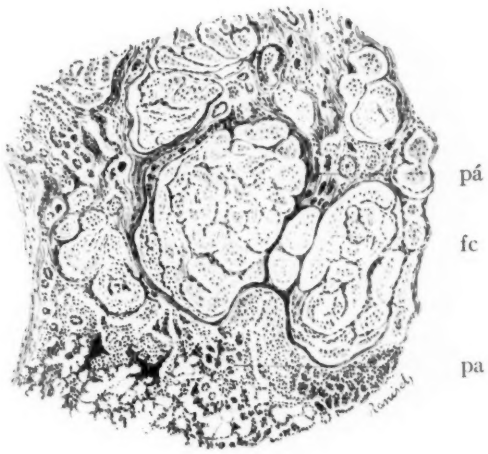

Fig. 4. Ocular 2. Zeiss. obj. A.A. Foam-cell tumor invading the parotid gland. pa., parotid; fc., foam cells; pá., remains of excretory ducts.

tissue separating the syncytia. At no place are signs of degeneration seen.

This case is histologically very similar to the first case. Both belong to that class of tumors in which the cells arise from the interfascicular connective tissue cells and endothelium. Both show an infiltrating character. They are called interfascicular lymphangio-endotheliomas, but are different from the usual type in that the cells show the peculiar tendency to become foam cells. The condition is best described by the term interfascicular xanthomatous lymphangio-endothelioma.

CASE 3. Male patient, had a tumor of the parotid gland, the size of a small walnut, which was enucleated by Dr. Albrecht Rosenstein, of Berlin. A short time afterward a small local relapse appeared. This was removed and there has been no subsequent recurrence.

The specimen was hardened in alcohol. Frozen and celloidin sections were stained with hæmatoxylin and eosin and Van Gieson's stain. The specimens show at one side a small amount of parotid tissue with common fat infiltration spaces (Fig. 4, pa.). Otherwise the new growth occupies the whole field. The tumor shows an exquisitely lobulated structure. The lobules are separated by a fibrous connective tissue stroma, poor in cells and containing a medium amount of blood vessels. Excretory ducts (Fig. 4, pá.) are still seen in this connective tissue stroma. They are the remains of the destroyed parotid tissue. The nodes are composed entirely of foam cells, among which is a framework of capillaries with a very small amount of connective tissue. (Fig. 5, fc., str.). No gland substance is seen in the tumor. The cells are arranged in round, oblong, sausage-like, or even branched stripes of foamy protoplasm about 50 microns wide. In one area, a capillary tuft is seen surrounded by a mass of foam cells. All the cells are full of a typical, foamy cytoplasm. In some areas the cell limits cannot be distinguished. In other places the foam cells appear as large polyhedral cells with faint cell walls. The well-defined, central nuclei are generally round with a small chromatin content. Some contain a nucleolus. No karyokinetic figures nor regressive changes are to be seen.

This tumor may also be defined as a xanthomatous interfascicular endothelioma of infiltrating character, but a special quality is represented by the exquisitely lobulated arrangement.

As already stated, in the above three specimens, the polarization test could not be applied because the cholesterin fat had been dissolved out by the alcohol used in the preparation of the sections. All test proofs of cholesterin fat could be made with a positive result in the following case.

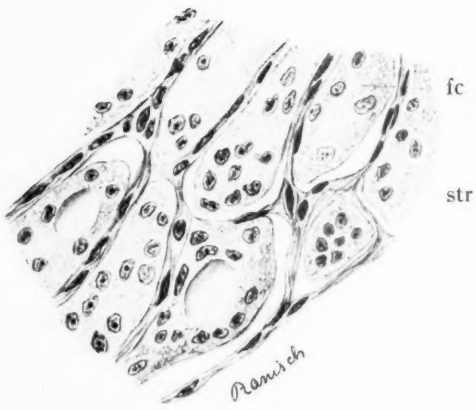

Fig. 5. Ocular 2. Oil immersion $\frac{1}{12}$. Parotid tumor enlarged. fc., foam cells; str., stroma.

CASE 4. Woman, 76 years old. The patient suffered a fracture of the neck of the femur, the arm and the pelvis on the right side, with injury to the intestine. Death was due to a fibrinopurulent peritonitis. The postmortem showed, on the right frontal lobe of the brain, a walnut-size, grayish-yellow tumor of marrow consistency. It was easily shelled out from the impression in the brain substance. The limits of the tumor, which extended to the dura, were distinct. The neighboring brain tissue was not changed.

The specimen was hardened in ten per cent formalin. Frozen sections were stained with Sudan, Nile blue and hæmatoxylin and eosin. Paraffin sections were stained with hæmatoxylin and eosin and Van Gieson's stain. The unstained formalin-fixed specimens were subjected to the polarizing microscope, which showed beautiful double-light refracting needle crystals. These double refracting needles disappeared on warming and were changed on cooling in the form of double-light refracting drops.

This new growth is identical with the endothelioma of the dura (psammoma) described by Ribbert (21). The spindle-shaped cells are arranged in bundles and whorls, with a fair amount of fibrous connective tissue stroma. The whorls in some places show hyaline degeneration and calcification. The spindle cells have a perivascular arrangement in some areas. Aside from the hyaline and calcified whorls, no signs of degeneration are seen. In addition to this usual picture, typical foam cells are seen scattered among the spindle cells in certain areas. These cells are in larger or smaller groups. The larger masses are well defined and appear as syncytia. On closer examination the cell walls are usually seen and the cells are separated by fine capillaries and connective tissue strands. The areas are very similar to the suprarenal cortex. Small masses, and even individual foam cells, may be seen in the specimen. The cells show exactly the same character in alcohol preparations as in the first three cases. They appear lighter than the surrounding cells. The nuclei are round or oblong, fairly rich in chromatin, and are sharply defined. A nucleolus is seen in some of them. The cytoplasm shows the same beautiful foamy structure. The meshes are distinct, regular, and appear to be the same size. In the formalin-fixed, frozen, Sudan preparations, the picture is even more beautiful. The foam-cell areas seen in the alcohol preparations are here represented by cells filled with yellowish-red distinct globules. These globules appear to be the same size as the meshes in the foam cells and they give a granular red raspberry-like appearance to the cell. In some of the cells, orange colored crystal needles are seen. The nucleus is often almost buried in the fat globules. In no case are any signs of degeneration of the nuclei seen in these cells. Some yellowish-red granular cells are also found in the concentric whorls which have not become hyaline or calcified. No signs of cholesterin fat are seen in the hyaline or calcified whorls. Besides these large cells, which are completely filled with the globules, many spindle cells, single or in groups, are seen to contain these yellowish-red fat globules. The fat-like substance appears first at either side of the nucleus toward the long axis of the cell. The more the droplets are increased, the larger becomes the cell. All stages are seen from the spindle-shaped and oblong cells to the large, round or polyhedral cells, which are completely filled with the fat-like globules. In none of these cells are any signs of degeneration seen. The globules in all sizes of cells appear to correspond in size to each other. The Nile blue specimens show the same general picture. The fat-like globules are stained a purplish-red color. These foam-cell groups, and the cells containing the globules stained by Sudan and Nile blue, correspond to the areas in the unstained specimens which showed the double-light refracting substance.

In this fourth case we were able to prove that the foam-cell structures contained cholesterin fat, which was dissolved out by alcohol. Histologically, the foam cells are identical in all four cases and there is no doubt that all have the same origin. These four cases deal with real new growths modified by the presence of foam cells, containing cholesterin fat, which is apparently due to an infiltration as a consequence of metabolic changes in certain cells of the tumors. On one hand, they all show quite a perfect agreement in the foam-cell formation; on the other hand, the variable ground structure.

All of these cases are of the pure type of foam-cell tumor. Cases 1, 2 and 3 show a total xanthomatous appearance of the tumor elements; case 4 is an endothelioma of the dura, some of the cells of which have acquired the ability to accumulate cholesterin fat. Therefore, it is also an endothelioma xanthomatosum.

CONCLUSIONS

1. Neoplasms, which show cholesterin fat, may contain it under three different conditions.

(*a*) The new growths may arise from organs, the cells of which *normally* contain cholesterin fat (suprarenal tumors).

(*b*) Cholesterin fat may be set free in tumors by degeneration of the parenchyma cells with secondary local resorption in the stroma (pseudoxanthoma).

(*c*) Tumor cells may contain cholesterin fat due to infiltration as a consequence of a special metabolism of the cell and persist as neoplastic cells.

2. This third type appears under the characteristic form of a foam-cell tumor, and may be a total foam-cell tumor or a partial type. All the foam-cell tumors known till now belong to the connective tissue-endothelial group and may appear with different ground characters (fibrosarcoma, lymphangioendothelioma, etc.). The total or partial foam-cell quality we characterize by the attribute *xanthomatosum*. (Fibrosarcoma, or endothelioma xanthomatosum, etc.)

3. True foam-cell new growths occur in other places besides the skin, i.e., mucous membrane of the tongue, parotid gland, tendons, fascia, and periosteal dura.

4. The appearance of tumor cells as typical undegenerated foam-cells allows the conclusion that cholesterin fat was in the cells.

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AUTOLITIC EXCISION BY A PENTAGONAL COMPRESSION SUTURE

Its Physiological, Pathological and Surgical Significance

(Experimental Studies from the Laboratories of Surgical Chemistry and Physiology and Surgical Pathology)

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WHEN it is necessary to operate for the relief of gastric ulcer, it is generally conceded that the ulcer should be excised or resected, on account of the demonstrated high percentage of malignant change in association with ulcer.

Keen (1), Bloodgood (2) and H. H. Janeway (3), and others, have shown that carcinoma of the skin usually begins in pre-existing lesions, such as moles, warts, sun, heat or chemical burns, and various other chronic inflammatory lesions. Surgical investigation shows that carcinoma of the alimentary epithelium, like that of the skin, often begins in pre-existing lesions.

Surgical studies upon the stomachs of animals, all made under full ether anæsthesia, show that this technique may be modified so that the proceeding becomes relatively simple. This is done by applying the principle of autolysis to surgery. While the field in which this method may be employed is limited, the experimental protocols show that, if rightly applied, a pentagonal compression suture will remove, by autolysis, a given portion of any hollow viscus as certainly as a knife. One objection to its use, however, is that the compressed lesion, being everted [1] and autolized, is not available for microscopic study and diagnosis.

The authors wish it understood that they are not advocating this method for the treatment of gastric ulcer or any other special lesion. They leave to the ingenuity of others, its possible adaptation to occasional and varied uses.

Interrupted compression sutures, which have occasionally been used in the past, are not more quickly introduced, nor as certain of constricting all the blood supply as a continuous stitch. We have found that a continuous suture in the form of a superimposed double pentagon is satisfactory.

Such a stitch will slowly but surely cut out portions of any hollow viscus, its principal

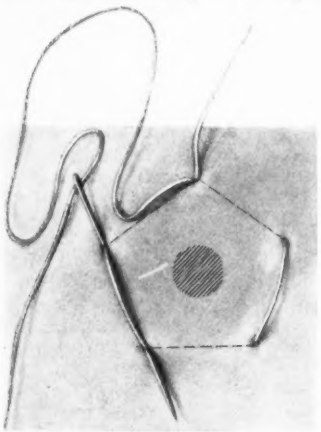

Fig. 1. Experimental studies on dog's stomach. Schematic plan of pentagonal autolitic stitch. First row of sutures inserted, and needle in position for second row. Parallel lines represent the ulcer. Note margin of safety from ulcer to suture line.

Fig. 2. Experimental studies on dog's stomach. The continuous suture completed and the included pentagon being invaginated from the serous surface. A similar pentagon lies upon the mucous surface.

[1] Everted in relation to the body cavity.

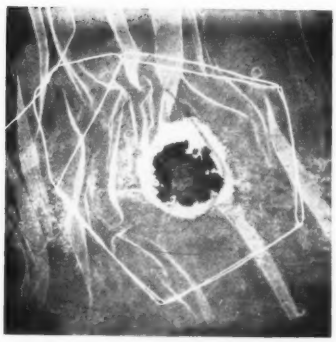

Fig. 3. Radiogram of wire pentagonal stitch around hypothetical ulcer made of litharge on chamois skin by Dr. Selby.

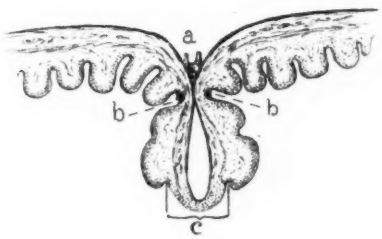

Fig. 4. Experimental studies on dog's stomach. Diagram of sagittal section through stomach wall and constricted mass; a, knot of the pentagonal stitch on serous surface; b, same stitch seen in cross section; c, ulcer. Note distance from pentagonal stitch to ulcer margin.

being that of a snare which compresses even capillary circulation. Its action does not depend primarily, as one might at first suppose, upon digestion by stomach or intestinal juices of the strangulated mass, for it is a recognized fact that the intracellular, proteoclastic (5) enzymes liquefy any cells which are removed from the influence of the circulation (6). It is a true autolysis, then, which brings about the necrosis and sloughing (Figs. 25, 26, and 27) and is one which any cell in the body is capable of producing quite irrespective of its function or position.

Any odd-sided figure may be used, but a pentagon is to be preferred. (See Fig. 1.) This approaches sufficiently near to a circle and yet the friction on tying is not too great to prevent adequate compression. A triangle, on the other hand, does not approach a circle closely enough, the apices being too far from the lesion which is to be autolized, the sides too near.

The stitch material should be heavy twisted linen that cannot be broken by the bare hands. This latter quality is an absolute essential and failure to make note of it is fatal to success. Such white twine is in common use and may be bought at house furnishing shops. The size should be about that of No. 3 catgut. The needle used is preferably straight, because a curved needle is not always easily reinserted through the same holes, which is a necessary part of the technique. Furthermore, a straight needle facilitates the introduction of the stitches approximately at right angles to the viscus wall, an important point because of the tough and irregular nature of the stomach mucosa. A single fold of mucosa not included in the stitch and passing into the pentagon may serve to vascularize it and prevent autolysis.

A full length of twine is taken; an approximate pentagon is scratched about the part to be excised; the needle is driven straight

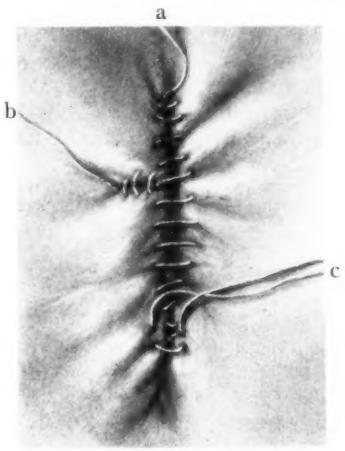

Fig. 5. Experimental studies on dog's stomach. Closure of serous surface after tying the pentagonal stitch. The main sulci often form an irregular Y, and are here shown closed by two continuous sutures, a and b. c is one of several safety stitches.

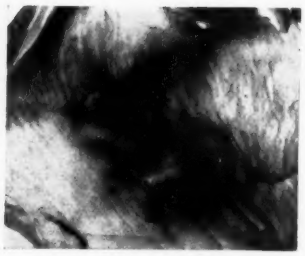

Fig. 6.

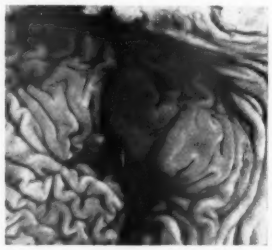

Fig. 7.

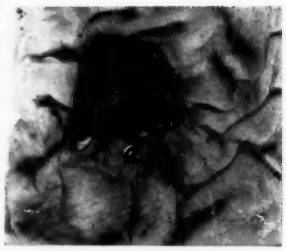

Fig. 8.

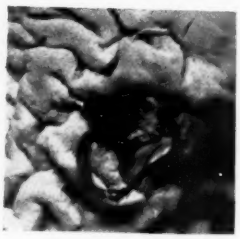

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 6. Dog 44. 5 days. External surface of the stomach showing perforation of the wall due to omitting row of sutures in serosa.

Fig. 7. Dog 54. 97 hours. Gross specimen showing inside everted portion of stomach wall, which has become discolored and swollen.

Fig. 8. Dog X. Specimen showing early necrosis of devitalized everted portion. (a) Point of most rapid necrosis, showing a part of the stitch and floor of the subsequently denuded area.

Fig. 9. Dog 44. 5 days. Specimen after separation of devitalized portion showing denuded area with stitch in the base.

Fig. 10. Dog 52. 6 days. Stitch in denuded area which has become smaller by contraction of scar tissue.

Fig. 11. Dog 62. 9 days. Base of pentagon after separation of main mass, one necrotic peduncle still adherent.

Fig. 12. Dog 69. 80 hours. Complete separation of pentagon. Autolitic stitch still hanging in the base.

in at one apex and out at an adjoining apex. The twine so laid lies on the mucous or external surface of the organ. After piercing the next apex, it lies upon the serous or internal surface, and so on around the figure. This procedure is continued until the area has been encircled twice, when the beginning and end of the continuous stitch are tied. (See Fig. 2.) It will be seen that the two pentagonal figures are superimposed, one lying upon the inner and one upon the outer surface of the viscus. (See Fig. 3.) When the knot is tied, if reasonable care has been taken to use the same holes the second time around, not a vestige of included tissue can escape strangulation (Fig. 4).

Tying the pentagon is a most important step. This knot must be tightened until after the twine is felt to cut into the mucosa, every particle of slack being taken up. It is convenient to wrap the loose ends of the twine around artery forceps before tying. This gives a firmer grip which applies greater pressure and makes sure of snaring every blood vessel.

A pucker of the serosa results, which is carefully aligned by a row of fine linen sutures, the ends of the sulcus being obliterated as shown in Fig. 5 at a. (See Fig. 5.) This often takes the shape of a capital "Y." Over this row a few interrupted sutures may be placed for safety. This superficial suturing is of vital importance to prevent perforation when the pentagonal stitch cuts through. (Fig. 6.)

In experimental studies the strangulated area falls off in from 50 to 100 hours. (See Figs. 7 to 12.) The shape of the resulting

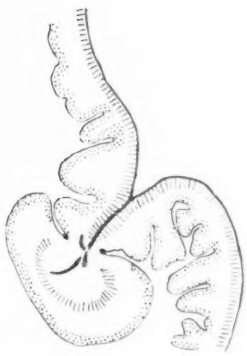

Fig. 13.

Fig. 14.

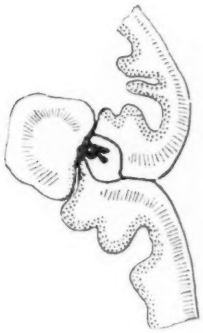

Fig. 15.

Fig. 13. Dog 54. 4 days. Diagrammatic drawing showing a cross section of the wall and the constriction caused by the stitch. The dotted area indicates the mucosa, which is intact, except where cut by pentagonal stitch. Parallel lines represent muscularis, which has also been cut by the stitch.

Fig. 14. Dog 58. 90 hours. Diagrammatic sketch showing appearance of the mucosa and separation of the muscular coats in the devitalized portion.

Fig. 15. Dog X. Diagrammatic sketch showing the appearance of the mucosa and separation of the muscular coats in the devitalized portion.

wound is longitudinal and its direction is apparently determined by the direction of the Lembert stitches. (Figs. 18 and 19.) As this is often a matter of choice, one may place the resulting scar parallel to the curvature or at right angles to it. In the experimental studies, it has been placed in whatever direction was convenient. As it has an appreciable width, varying of course with the size of the pentagon, some operators might fear the development of a permanent ulcer. As one of us (MacCarty) has shown, there is an abscence of all mucosa just after autolysis is complete. (Figs. 13, 14 and 15.) These studies, therefore, incidentally show the impossibility or at any rate the great difficulty of producing true gastric ulceration even by complete denudation or by other forms of purely local cellular injury, for in every case repair was prompt. This affords paranthetical corroborative evidence of the mass of work done by Kawamura (7) and others

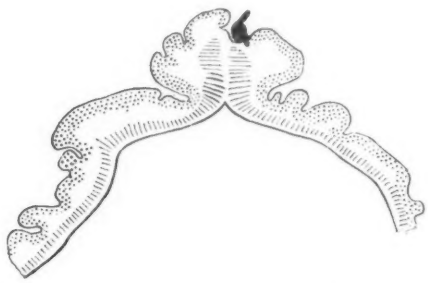

Fig. 16. Dog 52. 6 days. Diagrammatic section showing stomach wall after separation of devitalized portion.

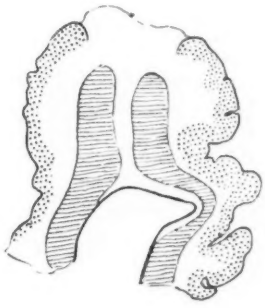

Fig. 17. Dog 62. 9 days. Diagrammatic sketch showing a section of the stomach after separation of the devitalized portion.

Fig. 18.

Fig. 19.

Fig. 18. Dog 58. 90 hours. Serous surface of stomach showing the line of superficial sutures.

Fig. 19. Dog 52. 6 days. External surface of stomach showing the line of superficial or retaining sutures.

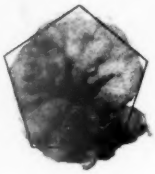

Fig. 20.

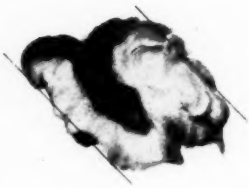

Fig. 21.

Fig. 20. Case 37378. Excised human gastric ulcer, one-half centimeter in diameter, showing the position of a pentagonal stitch which would excise such an ulcer. Note that distance between sides of pentagon is 2½ cm.

Fig. 21. Case 37378. Cross section through specimen seen in Fig. 20 showing the depth of the ulcer and the amount of scar tissue proliferation around the base on the peritoneal surface. Lines indicate the position and direction of a pentagonal stitch necessary for excision.

along these lines and which has long since demonstrated that ulcerations of the human alimentary canal, as we know them clinically, seem certain to have some underlying cause more far-reaching than a mere local disturbance. In the presence of a hydrochloric acid content many times as strong as in the human being, the unsutured autolytic wounds resulting from the pentagonal stitch heal over in dogs in about two weeks, so completely that the wound is difficult to find.

There is no apparent postoperative discomfort or clinical reaction. This suggests that a large area in a viscus wall may safely be autolized, should there be occasion to resort to the local destruction or removal of the part, and justifies the use of a pentagon ample enough to leave a full margin of safety around a gastric ulcer.

These pathological and physiological studies

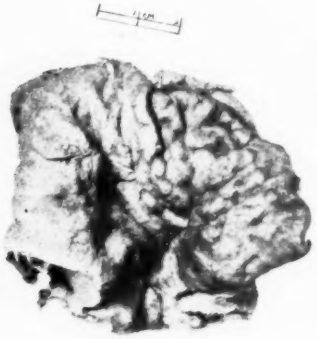

Fig. 22. Case 28173. Gross specimen of a resected human gastric ulcer, 8 mm. in diameter and 1 cm. in depth.

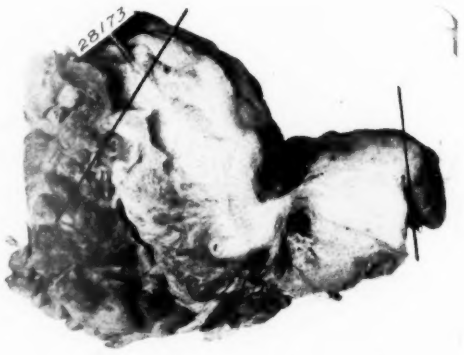

Fig. 23. Case 28173. Cross section through ulcer (Fig. 22) showing the depth and amount of scar tissue proliferation around the base. Lines indicate direction and position necessary for its excision. Note that sides of pentagon are 5 cm. apart.

Fig. 24. Case 25692. Cross section of an ulcer 9 mm. in diameter and 8 mm. in depth showing an extensive scar tissue proliferation around one side of the base. Lines indicate direction of stitch necessary for its excision. Note that sides of pentagon are 5½ cm. apart. Human case.

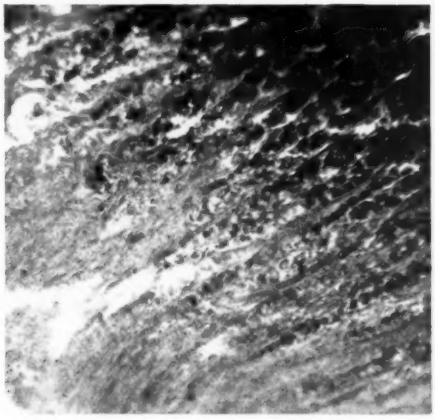

Fig. 26. Section through the mucosa of a devitalized portion of the stomach wall, showing necrosis probably due to the action of gastric juices. The darkly stained area is composed of epithelial cells near the muscularis mucosa.

embrace a number of associated phenomena of great practical importance.

1. The nature of the process of devitalization and repair of a portion of a visceral wall which is everted and strangulated.

2. The relation of the number, size and shape of ulcers, as well as of the degree of epithelial hyperplasia in the mucosa and inflammatory reaction, in the stomach wall, to the practicability of utilizing the principle of devitalization and autolysis as a therapeutic measure.

After the stitch has been tied there appears to be little or no hæmorrhage into the tissues, veins and arteries being obstructed almost simultaneously. The cells are deprived of food, oxygen and drainage. The resulting death manifests itself by dark discoloration of the part, fragmentation of the cells, and autolitic solution of the tissues. The point of greatest rapidity of this disintegration is at the point of suture compression. (Fig. 4 b.) This causes sloughing before the rest of the mass undergoes complete destruction.

The devitalized part is cast off, leaving denuded ends of all the coats. (Figs. 15 and 16.) These ends which are turned toward the interior of the viscus are quickly covered by

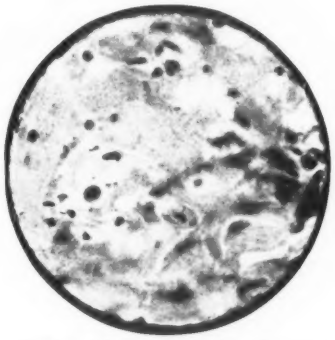

Fig. 25. Section taken through the submucosa showing necrosis and solution of cells. The tissue between these areas and the inner surface of the mucosa was almost intact. This necrosis is therefore probably autolytic.

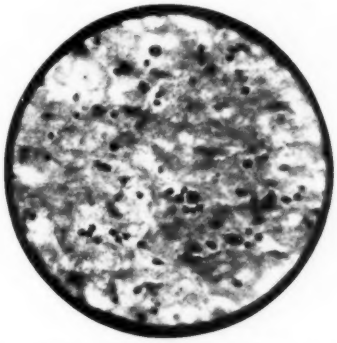

Fig. 27. Section through the submucosa showing necrosis and solution of cells. The tissue between these areas and the inner surface of the mucosa was almost intact. This necrosis is therefore probably autolytic.

connective tissue and epithelium. (Figs. 11 and 12.) The denuded area diminishes in size until only a linear scar remains to mark the site of pentagonal excision. The severed ends of the muscular coat (Fig. 16 and 17) are separated from each other by scar tissue which is derived from the connective tissue of the subserosa.

The feasibility of compressive autolytic destruction of a portion of the stomach wall is clearly demonstrated by the experimental material. Its applicability, however, to the destruction of gastric ulcers, as already stated, is limited. Studies made by one of us (8) on the morphology of human gastric ulcers teaches that the process of ulceration, erosion, or necrosis occasionally manifests itself in multiple lesions. This limits its applicability in some cases. It is further limited by the amount of scar tissue which one finds in the base of the ulcer and which extends usually to the peritoneum. This cannot be cut by the pentagonal stitch, which is effective only in normal tissue (9). Such a peritoneal involvement, moreover, does not indicate the diameter of the ulceration itself, since it has been found that ulcers may have narrow or wide peritoneal involvement. (Figs. 20 to 24.)

This scar tissue is not the important feature of a gastric ulcer when considered from the standpoint of the future of the patient. The future depends entirely, with the exception of perforation, upon the behavior of the epithelium of the mucosa of the ulcer border (10). This important structure exists only in the border, being found in the base solely in advanced stages of carcinomatous change. This statement is based upon the examination of three hundred resected or excised gastric ulcers, in which material it has been found that the line of demarcation between simple inflammatory epithelial hyperplasia and carcinomatous hyperplasia is not sharp. The mucosa border of small ulcers often presents changes in the epithelium which are morphologically indistinguishable from the epithelial changes which play so important a rôle in the life history of gastric ulcer and of its host. They bear no relation to the size and shape of the ulcer. Size and shape are also independent of the extent of peritoneal inflammatory induration. When carcinomatous epithelium of the mucosa has extended into the submucosa and the base of ulcers, it has occurred by direct extension or through the lymphatics. In this advanced and often inoperable condition, if operation be decided upon, extensive gastric resection should obviously take the place of excision either by knife or by autolysis.

From a practical standpoint, therefore, the occasional adopter of autolitic excision must, in the case of ulcers, not be guided wholly by the character of the ulcer base or of the peritoneal involvement, but more particularly by the necessity of destroying a large portion of the mucosa beyond the ulcer border. The successful application of the autolitic method of excision, if employed in the treatment of gastric ulcer, rests therefore upon the following cardinal principle. Carcinoma begins in the ulcer border and the comphrensive destruction of this must be the final object of operative intervention.

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A FURTHER CONTRIBUTION TO THE STUDY OF DISEASES OF THE ACCESSORY SINUSES IN RELATION TO DISEASES OF THE EYE, AND THE SURGICAL METHODS TO BE ADOPTED FOR THEIR RELIEF[1]

By J. H. BRYAN, M. D., Washington, D. C.

IT is only within the last few years that the importance of the study of diseases of the accessory sinuses in relation to diseases of the eye has been appreciated, and while a great deal of work has been done in the past by competent observers all over the world, showing the serious influence sinus disease has upon the orbit and its contents, nevertheless we still hear rhinologists say they seldom find suppurative sinus disease causing ocular symptoms, and we frequently find ophthalmologists treating ocular symptoms which have their origin in conditions arising in one or more of the accessory cavities surrounding the orbit. It is therefore very necessary that there should be a more cordial co-operation on the part of both the rhinologist and the ophthalmologist, in order that these very difficult and serious cases can be the better understood, and early measures adopted to relieve these conditions which threaten to destroy the sight in one if not in both eyes. I do not believe that I am overstating the case when I say many an eye has been lost because of the delay in recognizing threatening symptoms and adopting surgical means sufficiently early to prevent its destruction.

It is, therefore, incumbent upon every rhinologist to submit his sinus cases to a competent ophthalmoscopic examination, and on the other hand the ophthalmologist should seek the aid of the rhinologist in all cases where pressure or sepsis can bring about changes in the eye which are apt to impair its usefulness if not totally destroy it. In order to thoroughly appreciate the intimate relations these sinuses bear to the walls of the orbit, it is necessary to have an accurate knowledge of their anatomical relations; it will then not be difficult to understand why the contents of the orbit should so often be affected by pathologic conditions arising within the sinuses, either from an involvement of the walls in the pathologic process, or by the carrying of the septic material through the intercommunication of the veins and lymphatics of the nasal and accessory cavities with those of the orbit. The sinuses most frequently causing orbital complications are the frontal, ethmoidal and sphenoidal; the maxillary sinus may and does occasionally act as a causative factor in the disturbances of the eye; but much less frequently than the frontal, ethmoidal and sphenoidal. There is probably no part of the body where anomalies are so frequently met with as in the cavities that go to make up the head, and those who have not done some practical work on the anatomy of the head or have not availed themselves of the splendid work done by Zuckerkandle, Onodi, Mosher, and Killian must necessarily be at a disadvantage when confronted with a serious case of sinus disease which not only threatens the loss of the eye but the life of the patient.

The sinuses are subject to acute and chronic catarrhal and suppurative inflammation, and to tumor formations. Upon the intensity of the inflammation and the cavity or cavities involved depends the nature of the ocular disturbance. Among the orbital complications we are frequently confronted with when the sinuses are diseased may be mentioned neuralgia referred to the eye, and the supra-orbital nerve; secondary changes in the orbit brought about by mechanical pressure resulting in a change of form in the orbit, in a displacement of the eye-ball; in a disturbance of its mobility and function, and in an interference with the flow of tears.

Disturbances in the function of the eye may be a dilation of the pupil, congestion of the papilla, surcharging of the retinal vessels, asthenopia, narrowing of the fields of vision,

[1] Read before the Clinical Congress of Surgeons of North America, Philadelphia, November, 1911. See discussion, page 638

especially for colors, scotomata, and in severe cases amblyopia, changes in refraction, lachrymation, abscess of the orbit, exophthalmos, strabismus, diplopia, mechanical edema with a stretching of the lid, and retrobulbar neuritis, and Posey states that one of the evident signs of stasis in the circulation of the optic nerve is a distension of the lymph passages surrounding the retinal vessels.

The eye symptoms vary according to the sinuses affected, and in order to better understand the various and complex changes that take place in the eye when these cavities are the seat of a catarrhal or suppurative inflammation, I would divide them into anterior and posterior groups. In the former would be the frontal sinus, the anterior and middle ethmoid cells, and the maxillary sinus; in the latter would be placed the posterior ethmoid cells and the sphenoidal sinuses.

Occasionally in very severe inflammations of the anterior group, especially when the cavities are irregularly formed, some of these symptoms may be common to those arising from disease in the posterior group, generally however, they are quite distinct. It has been suggested by Friedenberg that a broad division of the cases may be made under three heads: First, those in which a distension of the sinus with inflammatory or other exudate encroaches on the space of the orbit, causing exophthalmos, limitations of mobility and interference with the sight. In these cases the condition of the accessory sinus disease is apparent.

The second type is where the inflammation extends to the orbit by lymph or blood channels, and causes orbital cellulitis or abscess, or septic phlebitis of the orbital veins with involvement of the optic nerve, either by extension of the inflammatory process or by compression of the nerve by the exudate. Under this head would occur thrombosis of the cavernous sinus which may occur from an infectious inflammation in any of the accessory sinuses; but it is more frequently a result of an infection from a suppurating sphenoidal sinusitis.

The third type is where there are no orbital symptoms or inflammatory reaction at all, but where the symptoms are subjective, owing to a loss of a small part of the central field of vision, such as a central scotoma. The frequency of eye disturbances in sinus disease cannot be doubted, as is shown by Birch-Hirschfeld, who in 604 cases of orbital inflammations found that no less than 409 were due to sinus disease. While acute sinusitis may affect the eye and its appendages it is generally the chronic inflammations in these cavities that cause the ocular disturbances.

In general, it may be stated that diseases of the anterior group of sinuses cause affections of the bulb, while those of the posterior group cause retrobulbar disturbances.

Considering the sinuses individually and their influence on the orbit:

Much depends upon the size of the frontal sinus, the depth of the floor, the thickness of its walls, and whether associated with disease of the fronto-ethmoidal cells as to the extent of the orbital involvement. The secondary changes in the orbit brought about by inflammatory diseases of the frontal sinus may be a change in the form of the eye-ball due to pressure, also a disturbance in its mobility and functions, and an interference with the flow of tears.

Disturbances in the function of the eye of a high degree have been observed, such as dilation of the pupil, and congestion of the papilla, varying in intensity with the degree of pressure; a narrowing of the fields for colors, scotomata and amblyopia. This serves, according to Kunt, to bring into prominence the fact that the peripheral and central sight in these cases can be raised to a certain grade through intense illumination which points not to atrophy, but only to a lowering of the perception and conductibility. Frequently after removal of the mechanical obstruction caused by an abscess there is a raising of the central and peripheral sight. Changes in refraction toward the hypermetropic and astigmatic side are observed in cases where the pressure of the dilated sinus wall is made at the equator of the eye-ball or on the posterior half.

If the purulent secretion is not freely discharged through the nose it often results in a diseased condition of the osseous walls of the sinus, the walls becoming so thin that the

secretion can find an exit through a fistulous opening in the supra-orbital ridge; through a fistulous opening at the inner angle of the orbit where the floor of the sinus is thinnest, or farther back in the orbit, producing an orbital abscess which is accompanied by all the compression phenomena from the side of the eye.

Orbital abscess is generally the result of an extension of an inflammation from one of the adjoining sinuses and principally from the frontal. The first symptom that shows itself may be the appearance of a small swelling at the inner angle of the orbit, while at other times the phenomena of ocular compressions make their appearance, such as lachrymation, pain in the eye, exophthalmos, strabismus with its resulting diplopia, edema with stretching of the upper lid, and when the disease has advanced to any extent ectropion. Before the pus has made its outward appearance there may be chemosis which partly or completely immobilizes the eye-ball, especially for the upward and downward movements.

As has been stated, a suppuration in the frontal sinus of any severity rarely results alone, but is usually accompanied by caries of the fronto-ethmoidal and the anterior ethmoidal cells. While this complication occasionally gives no evidence of its existence by a rhinoscopic examination, yet it is much in evidence as soon as the frontal sinus is opened. In such cases the ocular symptoms are increased in severity and render the diagnosis more difficult, for added to the sign of inflammation of the frontal cavity are those peculiar to the ethmoid. We usually find under such circumstances the visual fields for colors considerably narrowed, the exophthalmos more pronounced than in simple uncomplicated frontal sinusitis, especially so when the lateral and superior pressure is either at or posterior to the equator of the eye-ball; and also a restricted movement of the eye-ball inward.

The anterior and middle ethmoid cells according to the intensity of the inflammation are frequently accompanied by ocular symptoms varying in degree according to whether the abscess is closed or open, and the pus has a free discharge into the nose. In the closed variety the eye symptoms are almost immediately present. Abscesses in this region are accompanied by many of the ocular disturbances that are met with in frontal sinus inflammation, such as supra and infra-orbital neuralgia, so-called cysts of the orbit, orbital abscess, exophthalmos, disturbances in refraction, surcharging of the retinal vessels, scotomata, iridochoriditis, changes in the visual fields for colors, and a fixed or immobile condition of the globe.

The so-called cysts of the orbit are generally the manifestation of some form of disease of the ethmoid cells either in the form of a closed abscess or a dilatation of the cells, the pressure being so great as to cause a marked displacement of the eye.

As far as my own experience goes, I have not found the eye markedly affected in suppurative inflammations of the maxillary sinus, except in those cases where the natural opening is closed and the pressure from the confined pus is sufficient to cause a distension of the bony walls of the cavity. In such cases the nasal wall is the first to yield, and occasionally the pressure is so great as to cause some yielding of the floor of the orbit. When such conditions exist we may find lachrymation, blepharo-spasm, photophobia, pain on rotating the eye, a bulging of the eye upward and inward, exophthalmos, and a disturbance of the fields of vision. In the open and uncomplicated abscesses of the maxillary cavities I have not found any of the many symptoms mentioned by other authors.

The posterior group consisting of the posterior ethmoid cells and sphenoidal sinus may be affected in consequence of a general suppuration in the frontal, anterior and middle ethmoid cells, or of the ethmoid cells alone, and they are apt to have a most serious influence upon the eye and optic nerve. Owing to the marked anatomical irregularities found in this region it is at times impossible to tell which of these two cavities have the greatest influence in bringing about these serious disturbances of the eye and optic nerve when they are the seat of an active suppurative inflammation.

In order to understand thoroughly the relation of the ocular symptoms to the dis-

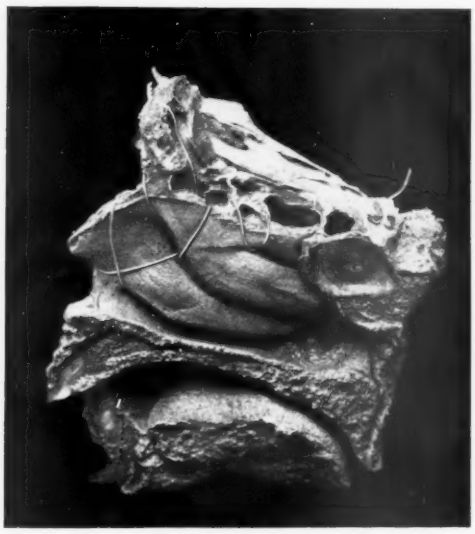

Fig. 1. Photograph showing the relation of the optic nerve to the posterior ethmoid cell on the right side, the sphenoidal sinus lying on a lower plane and not in relation to the nerve.

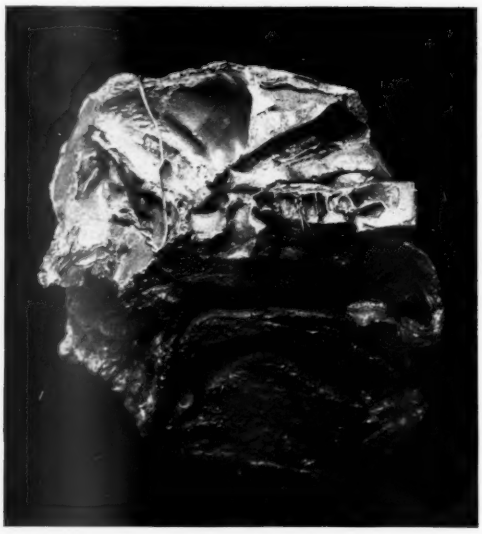

Fig. 2. Photograph showing the internal carotid artery in relation to the superior and external wall of the sphenoidal sinus on the left side, and the nerve lying external to the artery and not in relation to the sinus.

ease of the posterior group of cells, it will be necessary to call attention to the close proximity these cells bear to the orbit and optic foramen. As a rule, the posterior ethmoid cell is in relation with the optic nerve at its posterior and external angle, just at the roof. From this point the nerve passes outwardly to the globe and gradually increases the distance between it and the ethmoid cells. On the relation of the optic nerve to the posterior sinuses, Onodi, who has had exceptional anatomical facilities for investigating this question, says:

1. There may be a thick layer of bone between the optic nerve and the sulcus, so that neither the sphenoidal sinus nor the posterior ethmoid cells are in relation to the nerve, the bony stratum varying from 8 to 12 mm.

2. The ethmoid cells may be in relation to the optic nerve, and in fact almost surround it, while at the same time the sphenoidal sinus is not in relation to the nerve at all.

3. The optic nerve or chiasm may be in relation to its corresponding sphenoidal sinus and also to that of the other side.

4. Both posterior ethmoidal cells and the sphenoidal sinus of the one side may be in relation to its corresponding nerve.

5. The sphenoidal sinus may be in relation to the optic nerve of its corresponding side while the opposite nerve may be in relation to the posterior ethmoid cells on its side.

With such marked variations as exist in these posterior sinuses it is not to be wondered at that the complex ocular symptoms resulting from these cavities when diseased have been so little understood.

The following two photographs show some of the irregular relations these cavities bear to the optic nerve.

Fig. 1 shows the optic nerve coursing externally along the superior and posterior part of the posterior ethmoid cell, while the sphenoidal sinus lies on a much lower plane than the ethmoid cell and has no relation whatever with the nerve.

Fig. 2 shows the nerve lying external to the internal carotid artery which is in relation to the superior and external wall of the sphenoidal sinus — the nerve not being in relation to the cavities at all.

The transmission of the inflammatory process from these diseased cavities can take place through dehiscences, either congenital or pathologic. In several instances the optic nerve has been found lying in juxtaposition to the sinus and separated from it only by the mucosa. So, whether from contact or a transferrence of the septic process through the blood or lymph channels, it will be seen that the optic nerve can readily be affected from diseased conditions in the posterior sinuses, and the shorter the distance between them the greater will be the chance of a nerve involvement.

One of the earliest eye symptoms of a suppurative inflammation of the posterior ethmoid cells and the sphenoidal sinus may be mentioned congestion of the papilla and the ophthalmic veins, and as soon as recognized, attention should be directed to the sinuses as a possible source of the trouble. Among the other ocular symptoms produced by these disorders may be mentioned abscess of the orbit, exophthalmus, diplopia, pain in the eye and on rotation of the eye outward, and in consequence a fixation of the globe, a paralysis of the ocular motorius, the abducens and the trigeminus, disturbances of the fields of vision for colors, and scotomata. When pressure or septic transferrence is sufficiently great the optic nerve may be affected either in the caniculus or after it has entered the orbit, producing a retrobulbar neuritis with a resulting atrophy and blindness.

Owing to the variations that exist between the posterior sinuses and the optic nerve, not all cases show disturbances of the visual fields, and this may explain why so many cases of suppuration of the cavities in this region do not exhibit these symptoms.

It is only within the last few years that we have had any accurate information on this subject, but of late many valuable observations on the retinal and optic nerve changes as a result of sinus diseases are being recorded by ophthamologists in this country and abroad. Birch-Hirschfeld has observed central scotoma in three cases of sphenoidal sinus suppuration, and he believes that the papillo-mascular bundle is always involved first, and the peripheral field contractions are secondary; while Berger, on the other hand, lays great stress on the concentric contraction of the visual fields as a sign of the implication of the optic nerve.

Wallis in an interesting article in the Journal of Laryngology, May, 1911, reports eleven cases of positive sinus disease in which the visual fields were to a greater or lesser degree affected, and in which marked retinal changes had taken place. In all of his cases the contraction of the red and green were more marked than the white, the green being by far the most affected.

The contraction may be general or concentric; the variety of the contraction depends upon the sinus or sinuses involved. The anterior group cause contraction of the superior and inferior fields, while the temporal and bitemporal contraction is more common in the posterior group.

In all of his eleven cases he found temporal contraction, a characteristic symptom of chronic posterior sinusitis, while central scotoma was the characteristic symptom in acute posterior sinusitis.

My own experience agrees with his in so far as the contraction of the fields for colors are concerned, but to say that central scotoma is the characteristic symptom of acute posterior sinusitis is not quite true, for I have found this condition as one of the early symptoms of chronic suppuration of the posterior cavities. As the ophthalmoscopic shows, retinal changes are far more common in posterior sinusitis than in the anterior groups, we can readily understand why this should be so, when we consider the close proximity of the whole of the optic nerve to the sphenoidal and posterior ethmoidal cavities, and appreciate the facility with which the nerve can be affected by a suppuration in these cavities either from pressure on the nerve as it emerges from the canal, or by the toxins affecting the nerve fibres themselves. In those cases where the peripheral fibres of the nerve are involved we would expect to find a change in the visual fields, and when the process is more severe involving the papillo-macular bundle scotomata, varying in degree according to the amount of interference with these nerve bundles, will be found.

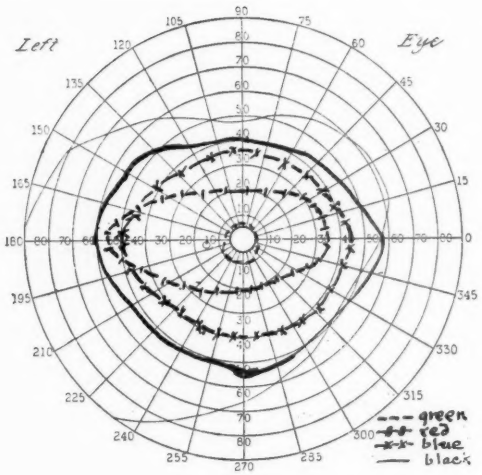

Chart I.

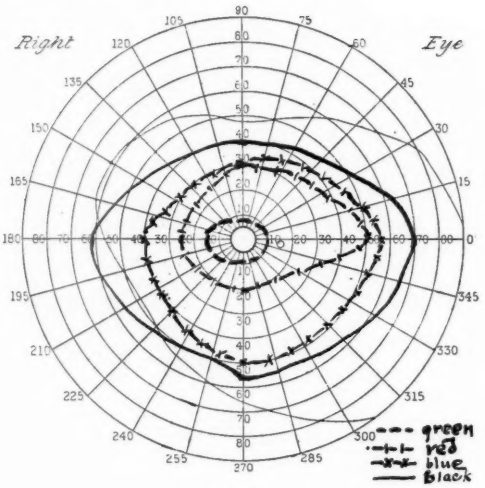

Chart II.

The following report of a few typical cases will serve to demonstrate some of the more common orbital complications resulting from disease of the accessory sinuses.

CASE 1. Mrs. V. (4), aged 40, chronic suppurating frontal, ethmoidal and sphenoidal sinusitis on the left side. Operation. Death resulting from lepto-meningitis, due to an infection from an unrecognized sphenoidal abscess.

This was one of my earliest cases, and has been previously reported in the transactions of the American Laryngological Association, and is only mentioned in this paper to show the effects of the disease upon the visual fields.

Not recognizing the presence of an abscess of the sphenoidal sinus, I operated on this patient by the Ogston-Luc method, combined with a free curettage of the anterior and middle ethmoid cells. The patient died at the end of the fourth day from a meningitis resulting, as shown by a postmortem examination, from a caries in the roof of the left sphenoidal sinus. In the light of my later experience I think it is rather remarkable that this case should have shown so few retinal changes, when we take into consideration the extensive necrotic changes that had taken place in all of the sinuses on the left side. There was no scotoma and the blind spot was normal in size, and as will be seen from Charts I and II, the visual fields for colors, especially for red and green, were decidedly narrowed.

The following is the result of the eye examination by Dr. Wm. H. Wilmer.

O. D. V.— 20/20 acc. c.+0.50 150.
O. S. V.— 20/20 acc. c.+0.50 0.
20 ft. R. H. ½° ad 10 abd. 5° Exop. 1°.
No diplopia. Color sense perfect.

	Field Vision. White.	Green.	Right Eye. Red.	Blue.
Sup	40	10	30	30
Temp	60	10	50	55
Inf	55	5	20	50
Nasal	60	15	25	40
	Field Vision.		Left Eye.	
Sup	40	5	20	35
Temp	60	5	55	50
Inf	55	5	20	40
Nasal	60	10	35	45

Blind spot normal and no color scotoma.

CASE 2. S. G., aged 15, chronic suppurating frontal and ethmoidal sinusitis. Operation. Recovery.

When first seen by me this condition had evidently been existing about six months, and on examination an enlargment was observed, very hard to the touch near the lachrymal region, but superior to the sac, and without discharge from the puncta on pressure on the sac.

Rhinoscopic examination showed the right middle turbinal much swollen, and on probing caries of the ethmoid cells was discovered. The secretions were purulent and while not very profuse were observed to come principally from the right side, also flowing back into the postnasal space over the posterior end of the right middle turbinal. The electric light showed the right frontal sinus opaque, while the left frontal and both maxillary cavities were translucant.

There was considerable pain referred to the supra-orbital region, slight exophthalmos, diplopa, and a fixation of the globe. Ophthalmological examination by Dr. Wilmer before the operation was as follows:

Ophthalmometer showed a corneal astigmatism

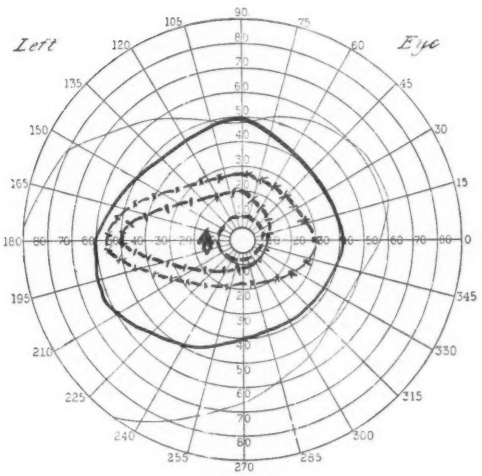

Chart III.

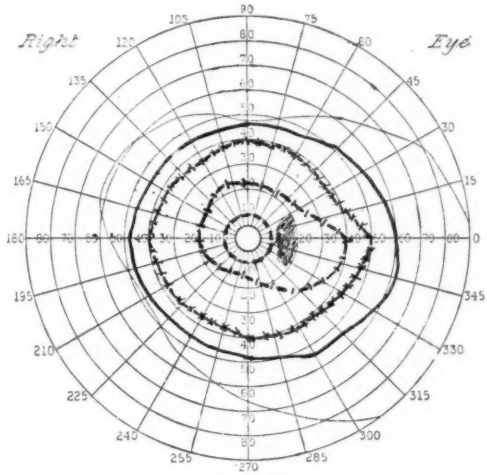

Chart III.

in the right eye of 0.50 D. with the rule in the left eye corneal astigmatism of 1.50 D.

O. D. V. = 20/15 accepted cyl. +0.25; axis 180°.

O. S. V. = 20/30 with cyl. +0.62, 90 = 20/15.

Reads Jaeger No. 1, 2″; 20 ft. exo 2° ad 4° ab 4°.

Color sense very good.

The opththalmoscope showed pulsation of the arteries and veins, and enlargement of the blind spot in both eyes, more marked in the right eye. The perimeter showed a decided narrowing of the fields of vision for white and colors in the right eye. There was also a marked scotoma with its center corresponding to the normal blind spot, amounting to something more than a mere enlargement, as will be seen in Chart III.

The left frontal sinus was the seat of a slight mucocele which was sufficient to reduce the visual fields for white and colors in the left eye.

This case occurred a number of years ago and was operated on by the Ogston-Luc method, combined with a free curettage of the ethmoid cells as fa back as the sphenoid. Extensive disease of the frontal and ethmoid cells was found. The patient made a rapid and uninterrupted recovery, and was discharged from the hospital in two weeks. An examination of the eye nineteen days after the operation showed no exophthalmos, mobility of the eye normal, O. D. V. 20/20, O. S. V. 20/20, 20 ft. exo. 1/2 ad 12° ab 4°.

CASE 3. Chronic frontal sinusitis, caries of the frontal ethmoidal cells, orbital absecss with a fistulous opening at the inner angle of the orbit. C. F., aged 26; when first seen he stated he had been treated for an orbital abscess for six months without obtaining any permanent relief.

On examination there was a small fistulous opening at the inner angle of the right orbit through which pus passed in considerable quantity. At this time the eye-ball was immovable, owing to the great swelling of the orbital tissues, drooping of the upper lid, and some pain on attempting to rotate the eye upward and inward.

Ophthalmoscopic examination made by the late Dr. Belt showed pulsation of the retinal vessels, and a narrowing of the visual fields for colors, especially for red and green, as shown in Chart IV.

A probe passed readily through the fistulous opening into the frontal sinus, showing that cavity to be the source of the trouble.

Operation. The middle turbinal was removed, and an opening made in the anterior wall of the frontal sinus, which was found filled with granulation tissue and pus; nearly the whole of the anterior wall and a part of the floor of the sinus and the anterior ethmoid cells were removed, leaving a large opening into the nose. The cavity was packed with iodoform gauze, one end of which was drawn through the nose and the wound closed.

In ten days the patient was discharged from the hospital cured, and he has had no trouble since. Examination of the eye one month after the operation showed the mobility perfect and the visual fields nearly normal.

CASE 4. Chronic suppurating frontal, ethmoidal and maxillary sinusitis, orbital abscess. Clinton S., aged 60, came under my observation February 14, 1911. He stated he had been having catarrhal symptoms for a number of years, and about October, 1910, he noticed a bulging of the right eye.

On examination the right eye was bulging to a very marked degree, the eye being pressed outward, downward and forward, no pain on rotation, the upper lid intensely swollen and edematous, the swelling extending to the neighboring parts of the cheek, no tenderness on pressure over the supra- or infra-orbital ridge, no headache.

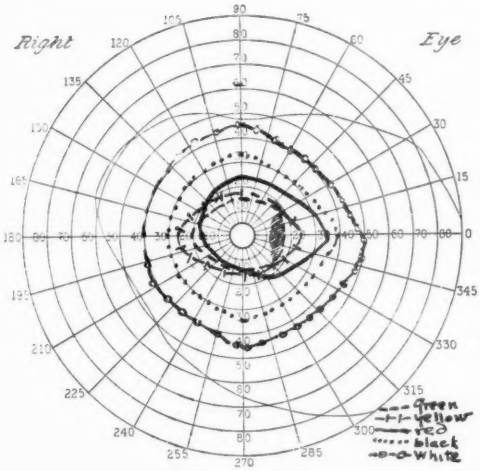

Chart IV.

Ophthalmological examination made by Dr. Greene showed O. D. V. 20/20. O. D. protrudes 6 lines, 4 mm. difference in the palpebral fissures, muscular balance perfect, the peripheral fields normal, enlargement of the blind spot and pulsation of both arteries and veins in the right eye. Chart V shows enlargement of blind spot.

Examination of the nose showed enlargement of the turbinals on both sides, the middle turbinal on the right side blocking the nose to a considerable extent, numerous polypi and pus found on both sides, but in especially large quantities in the right middle meatus.

Electric light showed both frontals and the right maxillary cavity opaque, while the left maxillary sinus was translucent. An X-ray examination showed all the cavities on the right side obscure.

On irrigating the right maxillary sinus a large quantity of fetid pus was evacuated.

February 16th. Removed the whole of the right middle turbinal, which was followed by a very profuse hæmorrhage and very difficult to control. Considerable ecchymosis of the conjunctive and of the upper and lower lids followed this operation. In consequence of the firm packing that had to be resorted to, there was an increased protrusion of the eye and an increased swelling of the lids.

March 3d. Assisted by Dr. Wilmer, a radical operation was done on the right side. The ethmoid cells were found necrotic and filled with granulation tissue; the inner wall of the orbit, as far back as the sphenoid, was broken down. The sphenoid was opened and found not to be involved to any appreciable extent in the necrotic process.

On separating the periosteum from the roof of the orbit the elevator entered the frontal sinus through its floor, which was found to be necrotic, and a very large quantity of thick, fetid pus flowed out of the cavity, which was of an unusual size. The floor of the sinus was removed to its full extent as far as the external angle; as soon as this was done the eye assumed its normal position in the orbit. The frontal septum was partially broken down and pus found in the left sinus.

An exploratory opening made through the anterior wall of the antrum showed it to be only secondarily affected from secretions flowing into it from the cavities above.

A gauze drain was placed in the back of the orbit, and brought out through the nose, and the wound closed in the usual manner. At first it looked as though this was going to be an unusually successful case, but in less than three weeks the exophthalmos and edema of the lids had returned. Although there seemed to be perfect drainage through the nose, an effort was made by Dr. Wilmer to drain the orbit by passing a small drainage tube into the orbital cavity through the tarsal cartilage; but this afforded little relief. So on May 23d the external wound was opened, and considerable granulation tissue found in the orbit, which was removed with a curette, and a large drainage tube passed from the external angle through the orbit and down into the nose. There was a great deal of irritation of the eye following this operation, probably due to the presence of the drainage tube, but this gradually subsided. The secretion of pus continued, however, in large quantities, and in the early part of June a culture was taken and yielded a pure growth of staphyloccus aureus from which an autogenious vaccine was prepared. During the summer my assistant, Dr. Dabney, gave in all eight injections, resulting in a marked diminution in the secretion of pus.

At present there is a marked improvement in the patient's condition; the eye is bulged not more than a line, the palpebral fissure normal, and the upper lid slightly swollen. There is still some secretion coming through a fistulous opening in the line of incision near the internal angle, which I have kept open by means of a drain, and pus comes from both the right and left side of the nose when the wound is irrigated through the fistulous opening, showing the frontal sinus on the left side may be the source of the continued trouble. It is possible the orbital wound may have to be reopened and the left frontal sinus operated on before a complete cure can be brought about.

A rather lengthy report of this case is given here in order to show some of the difficulties we have to contend with in these cases.

CASE 5. Acute suppuration and caries of the ethmoid cells on the right side producing marked ocular symptoms. Mrs. M., aged 35, consulted me June 3, 1911, complaining of intense pain over the right supra-orbital ridge at the inner angle, also down the right side of the face to the teeth; blurring of the vision, lachrymation and photophobia.

On examination there was no swelling of the face, but tenderness on pressure over the supra- and infra-orbital ridges, pain on rotating the eye outward, temperature 100.8°, foul breath, sub-maxillary

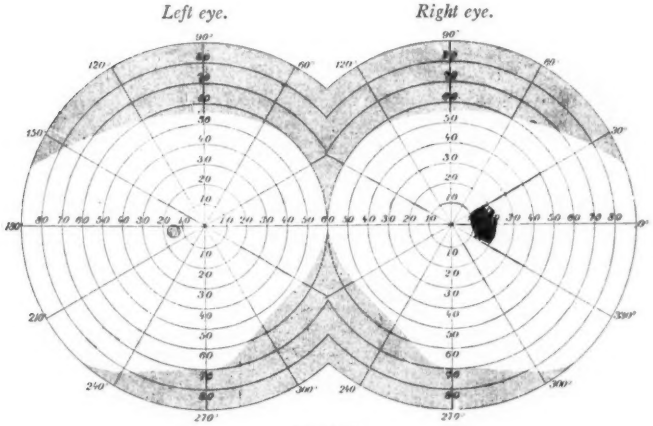

Chart V.

glands on the right side swollen and tender. Electric-light test showed the frontal and maxillary sinuses translucent. Rhinoscopic examination showed inferior and middle turbinals on the right side swollen, marked bulging of the anterior ethmoid cells, pus in large quantities found in middle meatus. Several ethmoid cells were opened with the probe, emitting foul-smelling pus.

Eye examination by Dr. Louis S. Greene, O. D. V. 20/20 with cyl.+0.75 axis 90=20/30.

O. S. V. 20/50 with s=0.253 cyl.+1.25 axis 90=20/20.

Muscular balance normal.

Ophthalmoscope showed congestion of the disc, with tortuous veins and pulsation in both arteries and veins. Visual fields showed an enlargement of the blind spot as shown in Chart VI.

June 13th. Removed the middle turbinal and curetted anterior ethmoid cells under cocaine. The nose was packed with iodoform gauze, and she was sent to the hospital, where she remained three days. There was a great deal of foul-smelling secretion following the removal of the gauze, but this gradually subsided, and the patient was entirely free from pain.

I saw the patient again after my vacation, October 6th, and found her greatly improved in general health, having gained twenty pounds, and there was also a marked improvement in her local condition, although a small amount of secretion was still being found in the posterior ethmoid region.

Examination of the eye, October 6th, O. D. V. 20/40 with cyl.+0.75 90=20/20. The perimeter shows an increased enlargement of the blind spot and a commencing scotoma and a hazy condition of the blind spot in the left eye, as shown in Chart VII.

October 27th. Opened the middle and posterior ethmoid cells and the sphenoidal cavity on the right with a rectangular knife and chonchotome and found the latter unaffected; there was some caries in the middle and posterior ethmoid region, which was freely curetted.

This case is an important one and shows the influence of disease of the posterior ethmoid cells on the optic nerve. Whether I have removed the source of the infection in time to prevent further changes in the nerve it is too soon to say.

Case 6. Abscess of the sphenoidal sinuses, producing paralysis in both external recti muscles and a resulting double internal strabismus. M. P., aged 57, was referred to me by Dr. Wilmer, April 17, 1899. When I first saw the patient he complained of intense pain in the occipital region, radiating to the vertex, vertigo, nausea, and double vision. There was a profuse, fetid, purulent discharge from both nostrils and from the postnasal space. After thoroughly irrigating the nose, a rhinoscopic examination showed the frontal, ethmoidal and maxillary sinuses to be free from disease. The posterior wall of the nasopharynx was observed bulging forward, nearly touching the velum palati, the bulging being greater on the right than on the left side. Pus in large quantities was seen in the vault of this space, flowing forward into the nasal chamber and into the pharynx.

When first seen by Dr. Wilmer there was a complete paralysis of the external rectus only. Examination showed O. D. V. 20/30 W. S.+0.75=C. D. O. 25 axis 180.=20 ft. homonomous dip=37° right internal strabismus, left hyp=6; O. D. pushed down 6=O. S. V. not given, ophthalmoscopic examination negative.

Within a few days there developed a left-sided external paralysis, and double internal strabismus.

April 21st. The patient was admitted to the hospital, and under cocaine anæsthesia I opened the right sphenoidal sinus by means of a gouge passed through the nose, and though this opening was made rather too high, it was sufficiently large to admit of a free discharge of pus which gave con-

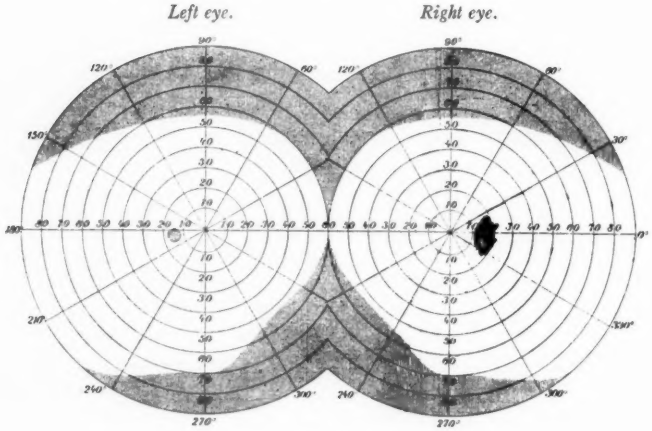

Chart VI.

siderable relief, lasting several days. At this time I supposed both sinuses communicated and drainage through right side might relieve both cavities, but the abscess did not drain well and the pain returned with increased intensity.

April 28th. Under ether anæsthesia I made a free opening into both cavities and curetted away a good deal of carious bone. The operation was followed by almost complete relief from pain and a very decided improvement in the paralysis of the right external rectus, while no improvement was observed in the paralysis on the left side. The sinuses were irrigated daily with a boric acid solution, resulting in such a decided diminution in the secretion, he was discharged from the hospital May 2d, very much improved.

Before I left the city for my summer vacation, the openings in the sinuses showed a tendency to close, and he was advised in case of a return of his painful symptoms to return to the hospital. This he failed to do, and he died during my absence from Washington. This case was operated on before the days of the radical operation. The recent advances that have been made in the surgery of these parts would enable us to treat a case of this kind more successfully now.

I have endeavored to present this subject both from the rhinological and the ophthalmological standpoint, but I do not pose as an ophthalmologist. Nearly all of the eye work in my cases has been done by Dr. Wm. H. Wilmer and Dr. Louis S. Greene, both of whom I wish to thank for their cordial support which they have rendered me, not only in the diagnosis, but in the management of my sinus cases with orbital complications.

The following description of the surgical measures to be adopted for the relief of sinus disease with orbital complications is an abstract from a paper read at the last meeting of the American Medical Association.

The majority of acute cases get well on establishing free drainage. I have never been called upon to do more in a surgical way than to remove the anterior extremity of the middle turbinate, but in chronic cases radical surgical measures are nearly always necessary. The operation treatment may therefore be divided into the intranasal or conservative, and the external or radical method. The intranasal method is applicable especially to diseases of the ethmoid and sphenoidal cavities.

It consists first in removing all obstructions, such as polypi and obstructing spurs, and the complete removal of the middle turbinate. This should be done by means of a curved scissors or the Luc forceps, under cocaine anæsthesia. Unless the case is urgent it is better to pack the nasal cavity with gauze until all danger of hæmorrhage has passed, which is generally two or three days. We are now in a position to determine the extent of the diseased area in the ethmoid cells. The ethmoid cells are now opened with a rectangular-shaped knife similar to one devised by Hajek, and removed by means of a sharp curette or a chonchotome. In many

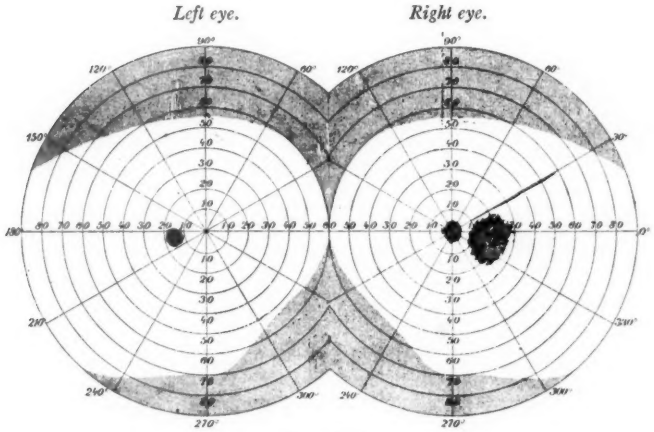

Chart VII.

cases, if the disease is not too extensive, we are able to remove the affected area, and in this way relieve the pressure on the eye. Ballanger advises the removal of the ethmoid cells and the middle turbinal en masse, by means of a knife which he has devised for this purpose. I, personally, have had no experience with this operation, but he speaks enthusiastically of his method, and, in skilful hands, I can appreciate the great advantage he claims for it. The sphenoidal sinus can in many cases be approached through the same route, after the removal of the middle turbinate, which exposes the anterior wall of the sinus and often brings into view its ostium. A probe passed through this opening is sufficient oftentimes to reveal a diseased condition of the sinus. This opening is rarely large enough to pass an instrument of any size into; but by means of a small curette it can be enlarged sufficiently to admit a chonchotome, bent at various angles. Biting upward and downward, nearly the whole of the anterior wall can be removed in a normal sinus, and relieve severe pressure on the posterior part of the eye. The tendency, however, is for the opening, no matter how large, to be closed over by a membranous formation, requiring frequent removal. Curetting this cavity should be very cautiously done, owing to the danger of injury to the optic nerve or internal carotid artery. Owing to the irregularities in the sphenoidal sinus, it is not always possible to relieve abscesses in this cavity by the intranasal method. In several instances I have found this cavity to extend outwardly and at the same time dip toward the pterygoid process, and in a preparation which I showed at a meeting of the American Laryngological Association several years ago, it was found to extend some distance down into the internal wing of the pterygoid process. In these cases I have been able to relieve abscesses of the sphenoidal sinus producing eye symptoms, by combining the endonasal method with the antral route. The maxillary sinus is opened through the canine fossa, and then with a gouge and sharp curette the sphenoidal cavity can be entered at its most dependent part, and free drainage established. The frontal sinus can, in some instances, be opened by the endonasal route, after the removal of the middle turbinate and the anterior ethmoidal cells. With a curette, an opening sufficiently large to admit the passage of a canula can be reamed out, and the cavity washed out daily with a saturated solution of boric acid. If the case is not of long standing this method is sometimes effective. Ingals has practiced this method of late, and uses an electric burr, through which a probe is passed into the sinus as a guide; and in his hands this has been successful. This method, however, is unsatis-

factory and dangerous, and can be applicable only to those causes of short duration, and in which the cavity is small and not filled with granulation tissue.

If the intranasal method fails to relieve the diseased process, then the more radical procedure must be resorted to and the cavity opened from the outside. Within recent years there has been a very marked change in the external operation on the sinuses. In the beginning of my work on these cavities, I practiced the Ogston-Luc method, or some modification of it, of opening the frontal sinus exclusively; but owing to several recurrences requiring secondary operations, I abandoned this method, and left the frontal wound open and allowed the cavity to fill with granulation tissue. This was a slow and very tedious procedure, but as far as the cure of the frontal sinus disease is concerned, it has been most satisfactory; no recurrences have occurred in any of my cases treated in this way.

From the cosmetic side the results are excellent; in the majority of the cases there has not been the slightest deformity resulting. As far as the cure of the frontal sinus disease is concerned, this method is satisfactory, but it failed to relieve those cases complicated with disease of the ethmoid cells presenting orbital complications, especially in those cases where the diseased process is located in the anterior and posterior ethmoidal cells and sphenoidal sinus.

Owing to the uncertainty of the above methods in completely relieving all the diseased conditions in the frontal, ethmoidal and sphenoidal sinuses, it is best to adopt the more radical operation proposed by Killian, which in the case of the frontal sinus has for its purpose a complete removal of all the diseased process, and an obliteration of the cavity, and in the ethmoidal labyrinth a complete removal of all the ethmoidal cells as far back as the sphenoid. The anterior or external route for removal of the ethmoid cells is by far the most radical and satisfactory method we have of reaching suppurative conditions of this bone. In this operation, the middle turbinate having been previously removed under cocaine, the nasal chamber is packed with cotton plugs, as advised by Killian in his operation. The incision is then made, commencing at the inner end of the eye-brow and is carried down along the outer edge and to the full extent of the nasal bone. The periosteum is now incised down to the bone, and is then stripped from the outer half of the nasal bone and from the whole of the nasal process of the superior maxilla. The next step in the operation is lifting the lachrymal sac from its bed, and detaching the periosteum from the inner wall of the orbit. Great care has to be exercised so as not to tear the sac and cause future trouble. Then with a sharp chisel the outer half of the nasal bone and the whole of the nasal process of the superior maxilla are removed down to the level of the lachrymal groove. This exposes the lachrymal bone and the anterior half of the os planum, which can be opened by means of a small chisel and removed with small bone forceps. This exposes the anterior ethmoidal labrynth, when, with bone forceps, we can with ease, working from before backward, remove completely the whole of the ethmoidal cells, back to the sphenoidal sinus. The plugs are now removed from the nose, and the edges of the wound are carefully brought together and sutured; some preferring fine wire, but I believe better cosmetic results are obtained if interrupted sutures of very fine silk are used. The incision is protected with either a collodion and iodoform dressing or, preferably, silver foil, and the eye is bandaged. If there should be any intranasal bleeding, the nose can be packed with strips of iodoform gauze, and which can be removed within twenty-four hours. I, however, have not found this necessary. I have already mentioned the various external operations for the relief of chronic suppuration in the frontal — viz., the method known as the Ogston-Luc and its modifications, and also the method of opening the sinus and removing the whole or part of its anterior wall and treating the cavity as an open wound. In this case the cavity is gently packed with iodoform gauze and removed every second or third day. Granulations form and slowly fill the sinus. Care should be taken not to irrigate the wound, as the granulations are weakened thereby, and do not grow rapidly. From four to six weeks

are required to fill a fairly large-sized cavity by this method, and in my experience is fairly satisfactory, as far as a cure is concerned. I have had no depressions of the anterior wall in my cases, such as is spoken of by some operators. This method is useful only in those cases not complicated with ethmoidal and sphenoidal disease.

The operation best suited for a permanent cure of a suppurative frontal sinusitis with or without eye complications and with or without ethmoidal and sphenoidal involvement is the one known as the radical operation by Killian. This operation has for its purpose a complete removal of all diseased conditions of the frontal, ethmoidal and sphenoidal cavities. It is the most satisfactory method that we have at our command for the relief of these very serious conditions. In the Killian operation the whole of the anterior wall and the floor of the frontal sinus, which is the stumbling-block in the old methods, are removed.

This operation is a formidable one and fraught with danger, not only to the patient's life, but to serious injury to the eye and its appendages, and, therefore, in order not to bring it into disrepute, it should only be undertaken by those surgically qualified. While this operation may be familiar to most, if not all of you, still a description of it may not be out of place here.

The turbinate having been removed at a previous sitting, the patient is anæsthetized, and placed in a semirecumbent position, at an angle of about forty-five degrees. The nose is then packed with cotton plugs, from four to five being required, according to its capacity. An incision is then made through the whole length of the eye-brow, commencing at the external angle. At the inner end the incision is carried down and along the nasal bone to its lower end. Before making the incision through the skin, Killian advises small cross-cuts to be made in order to facilitate a thorough coaptation of the edges of the wound when it is closed. The incision is then carried through the periosteum over the supra-orbital ridge and nasal bone, leaving the periosteum intact over the internal angular process where the bridge is to be made. The skin and periostial tissue are now elevated and forcibly retracted from the frontal bone, and with a V-shaped chisel a furrow is cut through the anterior wall of the sinus, parallel with and about a quarter of an inch above the orbital ridge; an opening sufficiently large to admit of a DeVilbiss bone forceps is made, and with this instrument and various shaped rongeurs, the whole of the anterior wall above the line of the incision can be removed flush with the frontal bone. The sinus is now completely exposed and all diseased tissue, including the mucous lining of the cavity, and all septa are removed. The second stage of this operation corresponds to that described as the external method for opening the ethmoid cells. The periosteum is stripped from the outer half of the nasal bone and the nasal process of the superior maxilla. Then, with a specially constructed curved elevator, the lachrymal sac is separated from its bed, and the periosteum is detached from the inner wall of the orbit and the anterior two thirds of the osplanum. The elevator is then turned upward, detaching the periosteum from the roof of the orbit. Great care has to be observed not to detach the pulley from its attachment. This can be obviated by having an assistant to hold his finger over and a little to the inner side of the supraorbital notch. Gradually, the periosteum is detached from the roof of the orbit as far as its outer angle. Then the outer half of the nasal bone and the nasal process of the superior maxilla are removed by means of a chisel as far as the lower end of the nasal bone. With a V-shaped chisel, a line is made from the top of the nasal bone upward and outward to the rim of the orbit. This line runs diagonally through the internal angular process of the frontal bone, the upper part of which becomes part of the bridge; the lower part is removed by means of a rongeur. The lachrymal sac and the globe of the eye are retracted outward. Then with bone forceps the lachrymal bone and the os planum are removed, and working from before backward, we can remove the whole of the ethmoidal cells, and the anterior and part of the inferior wall of the sphenoidal sinus. Between the opening made in the frontal wall and the ethmoidal opening, there is a bridge of bone left, which

is an important factor in reducing the deformity so apt to result.

The next step is to remove the roof of the orbit, which can be done with the bone forceps working from below upward, and then, standing at the head of the patient and working from above downward, the whole of the floor of the sinus can be removed as far as its outer angle with a chisel. Great care has to be exercised in not detaching the trochlea, otherwise a very uncomfortable complication in the shape of obstinate diplopia results; while this symptom occasionally occurs from slight disturbance of the trochlea, it frequently passes off within a few weeks. Thus far it has happened to me only once, and was very transient in character. A perforated rubber drainage tube or gauze wick is now placed in the floor of the sinus, and brought down through the nose. This drain is allowed to remain from twenty-four to forty-eight hours, when it is removed. The edges of the periosteum are sutured with catgut, and the external wound closed, great care being exercised to bring the cross-cuts together. The wound is closed either by a subcutaneous suture or numerous interrupted sutures of fine silk. In this way I believe we get a finer coaptation of the parts. The wound is then sealed with either silver foil or a ten per cent solution of iodoform and collodion. Killian, to further complete the obliteration of the frontal sinus, firmly presses the anterior wall against the posterior. This, however, leaves quite a depression, which he afterward corrects by an injection of paraffin. To obviate this depression resulting from the complete removal of the anterior wall of the frontal sinus, Mosher has made a valuable modification of this operation, by leaving quite an overhang of the anterior wall of the sinus. A sufficient opening is left so that all diseased conditions and bony septa within the sinus can be removed. I have followed his practice in a number of my more recent operations, and can testify to the greatly improved results over those in the original operation as proposed by Killian.

As has been already stated, the sphenoidal sinus can be opened and be completely exenterated in the radical operation on the ethmoid, but it occasionally happens that in certain cases of sphenoidal disease the sinus dips downward and extends considerably beyond the posterior ethmoidal cells in an outward direction. In these cases I have found certain eye symptoms, such as pain and photophobia continued even after the complete opening of the sphenoid in radical ethmoid operation. I have found it necessary in several cases to open the maxillary sinus and remove the diseased bone at the junction of the internal angle of the maxillary and sphenoidal sinus. Generally speaking, by combining the external route with that through the maxillary sinus, the most obstinate sphenoidal disease can be eradicated.

In conclusion, I would state: First, that in my experience the majority of severe inflammations of the sinuses are accompanied by more or less disturbances in the eye, these disturbances varying in intensity according to the severity of the sinus disease, and the reason they are not more frequently recognized is that they are not looked for until the eye manifestations are self-evident.

Second. The change in the visual fields is a significant symptom of sinus inflammation, and is generally associated with disease in the anterior cavities, but is also frequently found in disease of the posterior sinuses.

Third. Congestion of the papilla is an early sign of disease in the posterior sinuses.

Fourth. A scotoma and enlargement of the blind spots are so frequently found in posterior sinuses inflammation as to make them almost pathognomonic.

Fifth. There is no one operation that is suitable to all cases. The more conservative methods have relieved many serious cases, and if the conditions justify it the intranasal methods should be tried first; failing to bring about relief in this way, then one of the more radical measures will have to be adopted, and the operation that offers the best chance of reaching thoroughly all the diseased parts of the frontal, ethmoidal and sphenoidal cavities is the Killian, and in maxillary sinus complications a combination of the Killian with the Caldwell-Sue operation.

THE RELATION BETWEEN OTITIC AND INTRACRANIAL DISEASES[1]

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WHEN we consider the position of the tympanum or middle ear and its boundaries, it is astonishing that so few intracranial complications occur as a result of acute or chronic suppurative otitis media. Only a thin plate of bone, forming the roof, separates it from the dura and brain, while beneath its floor lies the jugular bulb. Anteriorly we have the internal carotid artery. The mastoid cells are usually the first to be involved when the inflammation spreads from the middle ear, although we may have a simultaneous affection of the mastoid cells and tympanum.

The sigmoid sinus, separated by a thin plate of bone from the inner wall of the mastoid cavity, is liable to be affected, especially when the streptococcus or pneumococcus has caused a virulent infection of the cells. This thin plate of bone, as well as the tympanic roof, may contain dehiscences through which it is easy for the infection to travel. The anastomosis of the numerous blood-vessels and lymphatics in the middle and inner ears provides a channel by which the poison can also be carried to the cranial cavity.

In addition to a septic thrombosis of the sigmoid sinus or jugular bulb, the most frequent intracranial complications are serous or purulent leptomeningitis, encephalitis, abscess in the temperosphenoidal lobe or cerebellum, or a serous or purulent inflammation of the semi-circular canals and cochlea. Cases of hæmorrhage from erosion of the internal carotid artery due to extensive caries and necrosis of the temporal bone have been reported.

The view was formerly entertained by physicians that a patient could not have any serious trouble with the ear unless he complained of considerable pain, and it is often most difficult for the aural surgeon to convince the family physician that some of the most serious cases of acute suppurative inflammation of the middle ear and mastoid cells are those unattended by pain or in which the pain is very slight. Such instances are more frequent in children than in adults and the temperature is apt to be very high in children. I have seen many cases of serious destruction of the mastoid cells, particularly in adults, in which it was impossible to elicit any feeling of tenderness over the mastoid bone when firm pressure was made. Absence of tenderness is due to the fact generally that the outer wall of the mastoid is very hard and thick. In such cases, we are more likely to have a brain complication, as the roof of the middle-ear and inner wall of the mastoid cells are apt to be very thin. The history of the case will help in making a diagnosis of mastoid disease, for generally we find in such cases a very profuse and thick discharge which has existed for some time. In many instances in which it was difficult to get the consent of the patient for an operation, owing to the absence of pain or pressure over the mastoid, after opening a thick outer wall, an extra dura abscess has been discovered involving both the middle and posterior fossæ.

Sinus thrombosis. The usual and more prominent symptoms of infective sinus thrombosis are a history of aural discharge, either acute or chronic, coated tongue, a chill followed by a sudden rise of temperature to 104° to 106° F., choked discs, enlargement of the glands in the neck, tenderness along the internal jugular vein, swelling of the tissues just below the mastoid tip, a positive blood culture and the presence of the streptococcus or pneumococcus in the discharge from the auditory canal. After a mastoid operation, a sudden rise of temperature, with or without a chill, is a symptom not only of sinus thrombosis but also of an abscess in the temperosphenoidal lobe or cerebellum. We must not overlook the fact that such a rise in temperature may be due to other causes, which should

[1] Read before the Clinical Congress of Surgeons of North America, Philadelphia, November, 1911. See discussion, page 640.

always be borne in mind, and many an operation for an intracranial complication has been performed when the cause has been elsewhere than in the cranial cavity. For example, a number of years ago I saw a child of eleven, who had an attack of grippe and tonsillitis, followed by earache and acute inflammation of the mastoid cells. The drum membrane had ruptured spontaneously, which gave some relief. This was but temporary, however, for on the following day she vomited and had a return of the pain. I saw her at this time and found tenderness over the mastoid (middle and lower thirds) with a sticky sanious discharge, and bulging of Shrapnell's membrane. I enlarged the opening, but in spite of the treatment, the mastoid symptoms became more marked and twenty-four hours later the temperature rose to 106.2° F. The mastoid cells were opened and some softened bone and granulations were removed. The temperature varied from 104° to 105.8° F. Sinus thrombosis was suspected. In spite of the fact that a careful examination of the chest had been made each day, no evidences of pneumonia were found until later. An important diagnostic point in these cases is the presence of the pneumococcus in the aural discharge. The temperature is elevated and does not show the variations which are characteristic of sinus thrombosis. It is extremely difficult to detect evidences of pneumonia on account of the consolidation being probably deep-seated. We must not overlook the fact, however, that in some cases of sinus thrombosis there is a high and steady temperature.

Cases of mastoid disease occur, in which the temperature remains elevated after operation and in which the cause is due without doubt to septic absorption. This is apt to be the case where pus has been found in the mastoid cells and the temperature has been considerably elevated some days before the operation. So that we must not be in too much of a hurry to attribute a high temperature to some intracranial complication.

During dentition children are apt to have attacks of acute suppurative otitis media and occasionally of mastoid suppuration. In such a case where the temperature remained high after the mastoid operation, suggesting a brain complication, no improvement in the temperature occurred until four molar teeth made their appearance through the gums. In very young teething children suffering from acute suppurative otitis media, the temperature is apt to cause considerable alarm and to suggest mastoid involvement or an intracranial complication, but when the tooth finally comes through, the temperature falls, and all the alarming symptoms vanish, and the purulent discharge is apt to grow suddenly very much less.

Another case, after a mastoid operation under my care, developed a high and steady temperature which was due to typhoid fever.

For several years during the winter and early spring in New York a number of cases of greatly enlarged cervical glands have been seen, in connection with acute suppuration of the middle ear, especially in children, and the question has often arisen as to the possible cause of the high temperature. Much alarm has been occasioned by the high fever as to the possible existence of a septic sinus thrombosis. The glands occasionally break down and have to be removed, but as a general rule they resolve, and the temperature will gradually become normal again. The fact must not be lost sight of that sinus thrombosis may exist in some of these cases.

The writer has known of a number of cases where a mastoid operation has been performed, and in which the patients later have had sudden chills and high temperature, and where the sigmoid sinus has been opened and found normal. In such cases the alarming symptoms have been due to an erysipelas, plainly evident twenty-four hours after the operation but no trace of which could be seen or suspected at the time of operation.

A case seen in consultation by me had been operated on for double mastoiditis following the grippe. He did well for two weeks, when suddenly he had a temperature of 104° F., following a chill, which fell to below normal, so that within twenty-four hours there was a difference of seven degrees in his temperature. Sinus thrombosis was naturally suspected, but a blood examination showed that the rise in temperature was due to malaria.

That a high temperature in a child suffering from an acute suppurative otitis media does not necessarily indicate involvement of the mastoid antrum or the sinus is shown in the report of the following case: A girl baby, seven months old, on November 19, 1907, had an attack of coryza and sore throat, with a temperature of 105° F., followed by an acute otitis media on each side. Both drumheads were incised, a free discharge followed, and three days later the temperature was normal. On the following day, the temperature was again 105° F. The drumheads were again incised and the temperature was again normal on the 29th, only to rise again. The fever gradually subsided and the temperature was normal on December 3d. The baby remained well until December 17th, when the temperature again reached 105⅘°. The fever gradually subsided and from this time on the patient made an uninterrupted recovery. The urine was repeatedly examined and a blood count made at various times. At one time the child had some of the characteristic symptoms of meningitis, such as rigidity of the muscles of the neck. A lumbar puncture was done with a negative result. I made all arrangements to do an exploratory operation on both mastoids and possibly explore the sigmoid sinuses. Before doing so, fortunately, I had another urinary analysis made and a large amount of pus was found, together with a few hyaline and epithelial casts, as well as the bacillus coli communis, showing that the elevation of temperature was due to a pyelitis.

Thrombosis has undoubtedly been caused by unnecessarily exposing the sinus during a mastoid operation when, as Koerner says, it is possible that pyæmia results from irritation of the sinus by the introduction of gauze, so that a parietal thrombus is formed. Other cases have followed from the nicking of the sinus, especially when the sinus is running out of its course. When a sinus is found exposed and covered with healthy granulations it is a great mistake to scrape them away with a curette, as by so doing thrombosis is likely to result.

It is most important if a double mastoid operation has been performed to know the nature of the infection in each mastoid, for, if a sudden chill occurs, and it is necessary to do some further operation, viz., open the sigmoid sinus, the surgeon can decide which sinus to open. In a case which I reported some years ago, the right mastoid showed marked streptococcic infection, while on the left side no streptococci were present. The patient had a chill and high temperature. The right sigmoid sinus, in consequence, was opened; a thrombus was removed, and the patient recovered.

The temperature does not always show marked oscillations and may remain elevated and simulate that of pneumonia. In such a case, occurring in a child in which both mastoids had been opened and both sinuses had been exposed, the thrombus was present in the one with a grayish wall without granulations, while on the wall of the sinus on the other side there were healthy granulations. This is an important point, viz., the condition and appearance of the sinus wall.

Blood cultivations have been made at the New York Eye and Ear Infirmary by Dr. Dixon in a great many cases for the purpose of determining the presence or absence of bacteræmia in suspected cases of sinus thrombosis. Positive findings have been more or less useful in establishing the diagnosis, particularly in those cases where the clinical symptoms alone have been insufficient, and where other sources of infection could be eliminated. Negative findings, however, are not proof that sinus thrombosis does not exist, for it is possible to have a sterile clot present, which of course could not give rise to a bacteræmia, and there appear to be certain other cases which have proven to have been septic, but which for some unexplained reason did not give positive results.

In a case of suspected sinus thrombosis which came under my observation last winter, a diagnosis of sinus thrombosis was made by a bacteriologist from a positive culture, in spite of the fact that the patient did not have the clinical symptoms. He was suffering from scarlet fever and developed an acute suppurative inflammation in each ear, and although he had streptococci in the aural discharge, the point of infection was probably

in the nasopharyngeal region, as he had a virulent catarrh, and nothing was found in the mastoid cells or sigmoid sinus. The clinical symptoms should never be overlooked and a blood culture simply acts as an aid in confirming a diagnosis.

Cases of primary phlebitis of the jugular bulb occur, more especially in children and in which the mastoid cells are not involved. It is easy to understand how readily the infection may pass through the floor of the tympanum or middle ear directly to the jugular bulb which lies beneath, particularly if the plate of bone is very thin. The infection is carried by direct absorption, or by means of the small veins and lymphatics. Most of the cases of sinus thrombosis follow a suppurative inflammation of the mastoid cells, and in performing all operations in such cases, it is most important to remove all diseased cells and particularly to open the mastoid antrum and establish a free communication with the middle ear. Many cases have been operated upon a second time because this had not been done.

The question of ligating or excising the internal jugular vein in all cases of thrombosis of the sigmoid sinus is not a settled one. For a number of years I have been in the habit of not ligating or excising the internal jugular vein in cases of thrombosis, provided the clot had not broken down, and there were no apparent evidences of the vein having become involved, even if blood did not flow from the bulbar end of the sinus. I have made it a rule to wait twenty-four hours before tying the vein, with the result that no further operation was necessary in most cases. This method of procedure applies particularly to thrombosis following acute mastoiditis.

In the operation for sigmoid sinus thrombosis it is often unnecessary and dangerous to excise the internal jugular vein at the same time, especially in the case of children, for the longer the little patient is under an anæsthetic the more grave becomes the prognosis.

The writer believes that ligation and especially excision of the vein add materially to the gravity of the operation and that the condition of the patient should be considered always before resorting to this further operative interference.

Brain abscess. An extradural abscess is frequently found in opening the mastoid cells. The patient presents the usual symptoms of tenderness on pressure over the mastoid bone, and as a rule there are no characteristic symptoms that the dura or sinus is exposed until the mastoid has been opened, although a patient may have a chill, a considerable rise in temperature, a rapid and bounding pulse and show a very careworn expression. On the other hand, a patient may work hard at some manual labor until the moment he comes to the hospital, and yet have a large area of exposed and thickened dura bathed in pus.

Abscess in the tempora-sphenoidal lobe. The characteristic symptoms are irritability, and especially pain in the head, optic neuritis, nausea or vomiting, and frequently the discharge from the ear becomes scanty or stops altogether. Change in a person's disposition is another symptom of importance. Chilly sensations or a distinct chill may occur.

As the disease progresses the cerebration becomes dull and the patient stupid. When an abscess has formed, the most important symptoms are a distinct lowering of the pulse-rate and a temperature slightly above normal or subnormal. When occurring on the left side, optical aphasia is an important symptom; these are laid down as the most frequent symptoms. If these symptoms were generally found, it would be an easy matter to make a diagnosis, but, unfortunately, we are apt to see many cases where the characteristic symptoms are wanting. While in mastoid disease, frequently the blood-count helps but little; on the other hand, in cases of brain abscess, the leucocytosis is high as well as the polymorpho-nuclear count. In one case which I recall of temporo-sphenoidal abscess, not only was the pulse rapid and the temperature high, but there were marked variations in the temperature, so that sinus thrombosis was suspected. The patient had a severe chill, an intense headache, and a convulsion lasting twenty minutes. He had, however, marked aphasia. The sinus was found normal but there was a well-marked abscess in the brain. He recovered.

A case recently walked into my clinic, complaining of severe pain in the head, which he had had for the past two weeks, and the patient looked very ill. There was slight rigidity of the muscles of the neck and marked tenderness over the mastoid. The optic discs were normal. There was a temperature of 100.5° F. and increased pulse rate. The leucocyte count was 11,000. A lumbar puncture was made and the fluid found to be sterile. On opening the mastoid cells, the pus was found under pressure in the antrum and with the characteristic odor of a brain abscess. A sinus was found in the tympanic roof and in the thickened dura with a large abscess in the left temporo-sphenoidal lobe. There was no aphasia. In this case there were evidently very few if any symptoms that would suggest a brain abscess. Pain in the head and the patient's general appearance with rigidity of the neck muscles suggested something more than a simple mastoid.

Cerebellar abscess. In cerebellar abscess, the most characteristic symptoms, beside slow pulse and low temperature, are severe headache, nausea, vomiting, vertigo, a staggering gait, choked disc and facial paralysis. I have seen a case in which the pulse was slow, and the patient had vertigo, vomiting, deafness, severe headache, etc., so that a diagnosis of cerebellar abscess was made, yet when the mastoid cells were opened, the semicircular canals were carious, which fact accounted for the symptoms. In another case of a child who was brought to my clinic, and who had characteristic symptoms of cerebellar abscess, including choked disc and retinitis, removal of granulations from the middle ear, which had seriously interfered with drainage, effected a cure. Still another case of suspected brain abscess was sent to me, from Buffalo, in which the symptoms were caused by artificial drums having been inserted in a case of chronic otorrhœa. As the patient heard very well with these aids to hearing, she was very loath to have them removed. In two days after they had been taken out, so that the pus could escape from the canals, all unfavorable symptoms had disappeared.

In all intracranial complications, daily examinations of the blood should be made in order to determine whether the leucocytosis is increasing or decreasing, and what relative changes are taking place in cell percentage. The leucocytosis occurring in the course of intracranial complications does not appear to be so high as in pneumonia. A sudden and sustained rise to about 20,000 or over with a polynuclear count above normal and rising has been found in cases of brain abscess, while 22,000 and over with a rising polynuclear count has been found in meningitis, and above 30,000 is an indication of pneumonia even in the absence of physical signs at the time. Exceptions occur and further investigation is imperative before we can rely with much confidence on the result of blood examinations in otitis and its complications.

The most important point to start from is a knowledge of the normal average leucocytosis and cell percentage in each individual, and I feel that this is the only rational basis from which to draw conclusions.

Suppurative inflammation of the labyrinth can occur from an acute suppurative otitis media, but is more frequently due to the chronic form. On exposing the middle ear, we may find a fistula on the inner wall of the middle ear opening into the horizontal semicircular canal, less frequently into the posterior canal. There may be fistulæ extending into the cochlea or the pus may make its way through the foramen ovale or rotundum.

The suppuration may be circumscribed or diffuse, and when diffused can readily extend to the meninges through the internal auditory meatus and cause a serous or purulent meningitis, or a cerebellar abscess may result or sinus thrombosis or rarely an abscess in the temporo-sphenoidal lobe.

The difficulties of making a diagnosis are very great when a labyrinthine suppuration extends to the cerebellum and causes an abscess and thrombosis.

In a case of acute otitis media complicated by labyrinthine suppuration, the symptoms are likely to be very severe. The more prominent symptoms are dizziness, nystagmus, a staggering gait and vomiting, subjective noises, hardness of hearing to complete deafness, when the cochlea is entirely destroyed. The temperature is not generally high, and

when it is elevated one should suspect a brain complication.

The symptoms of suppurative labyrinthine disease are quite similar to those of cerebellar abscess. According to Politzer, choked disc is observed with cerebellar abscesses but is absent in labyrinthine suppuration. Politzer says that "an important diagnostic symptom of a developed labyrinthine affection is the lateralization of the C_2 tuning-fork toward the better hearing ear, when the previous examination showed a lateralization toward the diseased ear."

It must not be forgotten that granulations and a cholesteatoma in the middle ear may give rise to dizziness and unsteadiness of gait, and thus simulate labyrinthine involvement. Of recent years a good many operations have been performed on the labyrinth, viz., opening and scraping the semicircular canals and cochlea, with varying results.

Neumann, of Vienna, on his visit to this country last winter, made much clearer the indications for this operation, and it is hoped that in the near future greater care will be used in discriminating between the operative and non-operative cases.

It is impossible, with the limited time at my disposal, to more than refer to serous and purulent leptomeningitis, and encephalitis. As in brain abscess, constant and persistent pain in the head is a most important symptom. In brain abscess the pain is apt to be localized while, in meningitis the pain is generally over the entire head. Cases of serous meningitis occasionally recover, according to my experience, but purulent meningitis is generally fatal.

From the preceding remarks, I would draw the following conclusions:

As the symptoms of a brain complication, particularly abscess, sinus thrombosis and labyrinthine suppuration, are frequently very indefinite, I would suggest, before resorting to an operation, that every aid to a correct diagnosis be taken by means of a blood count, blood culture, lumbar puncture, etc., in order to exclude the possibility of error, for many cases have been operated upon where the diagnosis has been incorrect, and where a little more time and careful study of the case would have prevented the mistake.

On the other hand, cases of intracranial disease, particularly brain abscess and sinus thrombosis, may present such few symptoms suggestive of these diseases that they are not recognized. After a mastoid operation, constant pain in the head should always excite suspicion of an intracranial complication, particularly of brain abscess or meningitis, even if other characteristic symptoms are wanting.

THE ORIGIN OF EPITHELIAL NEW GROWTHS OF THE OVARY[1]

An Abstract from a Monograph, now in the Writing, upon the Human Ovary

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THE theories as to the origin of the new growths of the ovary are almost as numerous as the authors who have dealt with this intricate subject. This lack of unity in our knowledge of the ovary induced me to take up this subject as a worthy one for investigation. If I have carried our knowledge a long stretch, or but a short one forward, I must attribute it to the study of comparative embryology, histology, and function. It was the cow's ovary that afforded the key. The study of the sexual organs of the higher vertebrates has proved of incalculable value, and the sexual organs of the cow are of the greatest interest to the student of the histology and development of the human ovary, for two reasons: firstly, owing to the close resemblance which the cow's

[1] A thesis for fellowship in the American Gynecological Society (from the Research Laboratories of McGill University, Montreal).

ovary bears to the human, and, secondly, owing to the easy access to large numbers of these organs from animals of all ages, obtained from the Montreal abattoirs. But my researches were not confined to the cow. They include many fœtuses and adults of the bitch, pig, sheep, rabbit, guinea pig and cat. In addition, my work includes thousands of serial sections, a work which I consider of the greatest importance to properly understand the interdependence of the several structures which are found normally or abnormally in the ovary. In addition, my work covers sections from both ovaries (human) from 120 cases. These were derived from the autopsies at the Friedrichshain Krankenhaus, Berlin, Germany, and from the autopsies performed at the Royal Victoria Hospital, Montreal. Moreover, as gynecological pathologist for the past nine years, it has been my privilege to examine a great deal of pathological material, and the sections from this, which bear upon the subject matter of this paper, enter in no small degree to assist in arriving at the conclusions to which the work leads.

From a very careful study of this abundant material it has been possible to draw certain conclusions, which, I think, will greatly help to unify our knowledge upon the origin of tumours of the ovary and assist, also, in a better understanding of the close resemblance between the ovary and the testicle.

To cover the literature upon this subject would carry me too far afield and unduly lengthen this paper; it will suffice to pass in very short review the many theories that have been, and are still, held by authors, explaining the origin of epithelial growths, cystic or solid, of the ovary. For a complete review of the literature I must refer the reader to the larger work which will appear in a few months. In the main there are the following views:

(1) That tumours arise from portions of the germinal epithelium, which have penetrated from the surface into the ovarian stroma; (2) that they arise from portions of the parovarium, which have invaded or become cut off within the ovary; (3) that they arise from ingrowths of the fimbria ovarica, where the latter finds its attachment to the outer pole of the organ; (4) there are those who hold the Graafian follicle responsible; (5) those again who trace them to the corpus luteum, and lastly, (6) those who maintain that any one of these structures may be the starting point of new growths.

With this short review of my material and with this short statement of the generally accepted theories, I will pass on to a description of

THE OVARIES OF YOUNG COWS

If we examine the ovaries of young adult cows we invariably find that in the center of the ovarian stroms there is an irregular, tortuous cavity lined by one or several layers of cubical cells. The outline of this cavity differs in each ovary that I have examined. In many it is large and very irregular, with constructions opening into large daughter cavities; in others the main cavity is almost filled with ingrowths from the main wall, just as the lumen of the human Fallopian tube is invaded by the mucosal folds. Between these two extremes there are all gradations. The lining is for the most part of a single layer of cubical epithelium. In some it bears traces of cilia upon tall epithelium; in others these are completely absent. Such are the characters of its cavity. To facilitate the subsequent descriptions I have applied the term "Rete Ovarii" to this epithelial structure, owing to its analogy with the rete testis. Time will perhaps suggest more appropriate terms, but I have endeavored throughout this work to apply to the ovary the terms applied to analogous parts of the testicle. The outer dimensions differ markedly in different cows. In some it is circumscribed and limited to the center of the ovary, its margins being about equidistant from the circumference of the ovary. But in others it extends from one pole of the ovary to the other and not infrequently enters into free communication with the surface epithelium of the ovary. This communication with the surface takes place rather frequently at the inner pole but very rarely at the outer. This is an important finding, as we shall see later. The communication is never a direct one between the abdominal peritoneal cavity

on the one hand and the rete ovarii on the other, but it takes place through the medium of extensions of the central cavity of the rete into numerous narrow tubular prolongations, which though generally running parallel yet anastomose and bifurcate freely.

Here, again, in these prolongations the epithelium changes much in character, being now tall and columnar, now cubical, now low, and at times cilia are found, but more frequently they are absent. Such is the rete ovarii in the young adult cow.

The rete ovarii generally occupies the central or inner and lower zone of the ovary nearest to the hilum, whereas the immature ova occupy the outer zone nearest to the surface of the ovary. Hence I find it convenient for descriptive purposes to divide the ovary arbitrarily into three zones—outer, middle and inner zones.

The middle zone is the zone of the Graafian follicle: these need not arrest our attention. But scattered among these are small masses of epithelial cells which stain very deeply with rosin and hæmatoxylin and are further characterized by total absence of cell definition, and in this respect bear some resemblance to the syncitial masses. There is no tendency whatsoever to the formation of a lumen. Other cell collections have distinct cell outline, stain very feebly with acid and basic dyes, and present an imperfect lumen which is traversed in many directions by protoplasmic processes which pass from one side of the lumen to the other. These two types of cell collections seem at first sight to be independent of each other, but in the bitch it is readily seen that they are not, but that they belong to the same system. In the bitch the second type of collection, if cut along its long axis, presents a long tubule with the cells lining each side and the cell protoplasms continuing across the lumen in parallel lines to the opposite side. The appearance suggests strongly an Indian bridge, two main long poles placed parallel and sticks laid close together transversely upon these. Suddenly this formation ceases and the type changes to that first described as resembling syncitial cells. These two may alternate very frequently.

Serial sections establish the same thing in the cow, that the two belong to the one system. They show further that hundred of cellular columns arise out of the rete ovarii and pursue a corkscrew-like course outwards towards the periphery of the ovary. If we follow one of these strands separately along its tortuous course we find that it presents a beaded appearance throughout, due to the alternation of the solid lumen-free with the larger imperfect lumen-bearing portions. I have described these as coursing outward from the rete toward the periphery but from a developmental point of view it would be better to describe them as coursing inward from the periphery to open into the rete. These for the most part occupy the middle zone of the ovary.

One other fact. The rete ovarii in the cow never extends beyond the zone occupied by the deeply stained cells of the parenchyma of the ovary; it never encroaches upon the connective tissue of the hilum of the ovary and therefore never enters either the hilum or the pedicle. The parovarian tubules are separated by a long interval from it.

If now we wish to understand the origin and the function of these structures we must turn our attention to the

OVARIES OF THE FŒTAL CALF

I will not endeavour to outline the changes that take place in the fœtal gland at various stages of fœtal life, but rather content myself with an outline of the function and origin as gathered from a comprehensive study of thousands of serial sections derived from fœtuses of all ages. In the earliest stage of fœtal life when the ovaries begin to appear we find that they arise upon the inner side of the Wollfian body as a projection of loose areolar tissue covered by mesothelium. This mass soon becomes pediculated and at the base of the pedicle the large Wollfian body, with its distended glomeruli nearest to the attachment of the ovary, is to be seen. Soon the surface epithelium of the ovary begins to multiply, becomes many-layered and is sharply defined from the rest of the ovarian or testicular stroma. Later the whole ovary becomes permeated with irregular tubules in

which as yet ova cannot be recognized. These tubes soon reach the hilum of the ovary, penetrate it and finally come into contact with the convex wall of the glomeruli of the Wollfian body, effect a communication with these and pass on toward the outer margin of the broad ligament between the Wollfian glomeruli on the one side and the ovary on the other. With several glomeruli this outgrowth enters into communication as it passes them. This description is very different from that of all other authors, who contend that the ovary is invaded by the Wollfian body, whereas my work shows clearly that the growth of the epithelial structure of the ovary is from the ovary outward to the Wollfian body and not in the opposite direction. The fuller reasons for my contention I will outline later. But it may be here stated that even in the young calf I have found ova in all the tubules which, starting from the surface of the ovary, run inward to the rete ovarii. Not only have I found ova in these tubules in all their length, but in the young fœtus I have found them frequently in the rete ovarii and for some distance into the rete as it passes into the hilum and pedicle of the ovary.

THE OVARIES OF THE AGED COW

In the ovaries of an aged cow the two same types of tissue are found as that described in the young adult, (1) the syncitial type, lumen-free, deeply stained strands, and (2) the larger, globular, lumen-bear ng, faintly staining cell collections. But n these latter a remarkable change has taken place. They have grown to large dimensions, are perfectly spherical and each bears within a hyaline basement membrane, an abortive membrana granulosa, an abortive discus proligerus, and at least one abortive ovum. The membrana is made up of a single layer of vacuolated faintly stained cells, tall and shaggy, bearing a very small amount of cytoplasm. These rest with their base upon a structureless basement membrane. Within this row of cells which constitute the membrana granulosa and separated from it by a more or less wide space is another row of similar cells with their bases pointing toward the center of the follicle and arranged to mimic very closely a normal discus proligerus. The interval which lies between these two circles of cells and which ordinarily would be occupied by the liquor folliculi is bridged over by long protoplasmic processes.

The abortive ovum consists of a hyaline vitelline membrane about which the cells of the discus proligerus are arranged radially. The inner margin of the membrane is sharply defined as in the normal ovum, but the outer margin seems to be prolonged between the cells of the discus as in the normal to give rise to the zona radiata. This central zone has many of the characteristics of an ovum. It is about the normal size; the clear rim corresponds to the vitelline membrane of the true ovum, which it resembles most closely. But this abortive ovum differs from the normal in never possessing a nucleus or nucleolus. In many cases such abortive follicles contain 2, 3 and even 16 such abortive ova. Serial sections show that each ovum is more or less attached to the periphery of the follicle by a strand of hyaline tissue which emanates from the outer surface of the vitelline membrane and finds attachment to the inner surface of the outer wall of the follicle. Do any of these imperfect ova ever reach such a stage of perfection as to develop into mature Graafian follicles? I am unable to say with any degree of certainty. In many instances such seems not only possible but probable, for I find all gradations between the mature and the immature abortive follicles. Moreover, the latter do not build a tunica vasculosa for themselves.

If we now examine the rete ovarii of the same cow we find it also has taken on the function of building abortive ova. Here they occur by the hundreds as pediculated masses from the inner wall of the cavity. Their mode of formation is as follows: In the earlier stages there is a heaping up of epithelium at one spot, then absorption by one central cell of the cells immediately surrounding it, or apparently first the cytoplasms of these cells fuse and then their nuclei. Elsewhere later stages in the process are recognizable, the mass becoming more and more pedunculated, there now being an almost typical discus proligerus with central oöcyte. As

the pedicle becomes more and more stalk-like the nucleus of the oöcyte liquefies and there remains nothing but a homogeneous vitelline membrane surrounding clear or slightly granular contents, and surrounded by one or two cell layers of an imperfect abortive discus proligerus. There can be no question regarding the nature of these bodies. The main cavity of the rete ovarii contains hundreds of these oöcytes and atretic ova in all stages of development and degeneration.

Let me repeat that these are seen only in the old cow: let me also repeat that in a single follicle there may be from one to sixteen of these striking vitelline shells.

There can be but one translation of this series of phenomena, namely, that the central cavity and its diverticula are persistent remains of the invaginations of the primitive germinal epithelium into the substance of the ovary. Here in the cow we have a persistence, in part, of one stage of the process whereby the normal Graafian follicles of all vertebrates are developed. During adult life the further metamorphosis of the germinal epithelium lining these diverticula is arrested. But now in old age, as may be observed in many other tissues of the body, what may be termed a reversionary process manifests itself, and the cells as they lose their adult characters revert to an earlier stage in their embryogeny and assume once more properties which characterize them in the developing stage.

Summing up our present knowledge of the cow's ovary leads us to the following conclusions: that the analogy between the testicle and ovary is as close as it is possible to imagine; that each is developed in the same way from the same anlage; that each contains the same structures as the other; that the whole glandular or epithelial structure of the ovary and testicle is derived from the germinal epithelium; that the Pfluger's columns in the ovary are developed in the same way as are the seminal ducts of the testicle, by growth and extension of the germinal epithelium; that the further continuation of these toward the centrum of the ovary corresponds to the vasa recta of the testicle; that the assemblage of these into a common tortuous cavity in the center of the ovary in the mediastinum — rete ovarii — is the same as the assemblage of these into the rete testis in the male; that the straight tubules outside the ovary which unite the rete ovarii to the remnant of the Wollfian duct (Gartner's duct) are the remnants of the Wollfian body and correspond to the straight vasa efferentia of the testicle which unite the rete testis to the epididymus, and lastly, that the remnant of the Wollfian duct in the female, Gartner's duct, is the analogue of the epididymus. In short, the corresponding parts in the fœtal calf and the fœtal bull are:

	Male	Female
	Of Germinal Epithelial Origin	
1.	Tubule seminiferi,	Pfluger's egg cords.
2.	Vasa recta,	Vasa recta (ducts of middle zone of ovary).
3.	Rete testis,	Rete ovarii or central cavity of ovary.
	Of Wollfian Origin	
4.	Vasa efferentia,	Straight tubules of the parovarium.
5.	Epididymus,	Gartner's duct (Wollfian duct).
6.	Vas deferens,	The obliterated portion of Gartner's duct proximal to the uterus.

Such is the case in the fœtus during the early months of gestation. But later in fœtal and in post-embryonic life remarkable changes take place. Many of the structures of the ovary become useless and atrophy owing to the fact that the ova and the semen pursue different courses to come into the world. Had the ova to travel through the vasa recta, rete ovarii, vasa efferentia and Gartner's duct, these would remain in direct continuity as in the male. Such is the case in some of the lower vertebrates; but in the higher the ova pursue an opposite course and atrophy of structures follow as a direct consequence. The first parts to atrophy are the vasa recta, which connect the Pfluger's tubules with the rete ovarii. In the cow thousands of these disappear, but hundreds remain as solid columns of deeply stained epithelial cells, as already described. The atrophic ones I have traced in all stages of their atrophy and I have shown that those

which remain may, in advanced age, take on in an abortive way the function which they had more or less impressed upon them in embryonic life owing to their origin from the germinal epithelium. In the fœtal calf I have found hundreds of ova developing in the vasa recta as well as in the rete ovarii. But these atrophy and the function of ovulation is soon lost, but not completely, as we have seen in the aged cow.

The next part to atrophy in the cow is the portion of the rete ovarii, which extends beyond the limits of the ovary into its hilum. This totally disappears, leaving not a vestige.

Such is the condition of the cow's ovary before and after birth. In the bitch the amount of atrophy is not nearly so great, consequently many more remains of the fœtal structures are to be found. In the pig and sheep on the other hand very few remnants of the vasa recta are to be found, and the rete ovarii is reduced to an insignificant structure. The guineapig and the rabbit occupy intermediate places.

If we now turn our attention to the human ovary and incidently to the human testicle, with our present knowledge derived from the higher vertebrates, the whole subject becomes intelligible.

THE HUMAN OVARY

The human ovary in early fœtal life is indistinguishable from a developmental point of view from that of the cow. Pfluger's egg cords pervade the ovary in all directions right down and into the hilum, and ova by the hundreds are seen not only in the parts which correspond to the vasa recta but also in the rete ovarii. The construction of the testicle at a corresponding age is parallel throughout. Later in life a slow degeneration of the parts which correspond to the vasa recta and of all that lies beyond that, viz. rete ovarii down to the parovarium (which never invades the ovary as I will demonstrate later) takes place. This degeneration I have been able to trace in all its stages through fœtal life. Now an interesting fact comes into prominence, which is that the higher we rise in the vertebrate kingdom (with occasional exceptions) the more complete is the disappearance of these fœtal ovarian structures which I think we must admit lack a function in the female. But we find also that the amount of atrophy of these functionless tissues is not a constant figure in one species. In the same species there are many reversions to the lower types. For example, in the young child up to two years where there seems to have been a retardation in the sexual development, I have seen the fœtal structures almost wholly preserved and ova developing in the vasa recta in close proximity to the rete ovarii. At the other extreme I have found human ovaries in which in serial sections I have not found a trace of the recta and of the rete ovarii (this statement will be modified later when I treat of the interstitial cells of the ovary). In the former type of case have we to deal with a simple retardation of development or have we to do with a permanent persistence of fœtal structures? It may be either process. Such late development of the sexual apparatus is quite paralleled in the adult where we find menstruation beginning at any age between 9 and 18 years and the uterus, as pointed out by Pinard (and this accords completely with my own clinical experience), does not in many cases reach its full development until 30 or 32 years.

But such cases are the extremes and are interesting only from a developmental point of view. It is the vast intermediate multitude which are of greater clinical interest. The general run of human ovaries do contain quite a quantity of these fœtal remains in spite of Nagel's statement to the contrary. Had Nagel studied the development of the human ovary through the medium of comparative anatomy he probably would have arrived at a very different conclusion. Suffice it to say that in the great majority of human ovaries I have found variable quantities of glandular tissue which was not connected with Graafian follicles or other functioning tissue; in other words such ovaries contained variable quantities of functionless tissue, and interesting above all else is the fact that this arrest of complete expunging of functionless tissue is always bilateral when present at all. That is, both ovaries are similarly involved. Moreover, in the 120 cases in which I examined both ovaries, I found that the same

variability takes place with regard to the rete ovarii. This was present in exactly one out of eleven cases, and when present in one ovary it is almost invariably found in the opposite ovary.

The rete ovarii in the human occupies a somewhat different position relative to the ovary as compared with the other vertebrates. In the human it lies in many cases somewhat removed from the ovarian stroma in the beginning of the hilum. For this and for other reasons it has been universally accepted as of parovarian origin. But when we know through embryological study that the same structure stretched in fœtal life from the core of the ovary to the infundibulepelvic ligament, and that I have studied it in all the stages of its atrophy, it is a matter of small moment which part may persist, or whether that persisting part may lie within the ovarian stroma or somewhat removed from it. That is exactly the variability which we do find, for in some cases the remnant in adult life lies in intimate relation with the ovarian stroma, whereas in other cases it is somewhat removed. Even when somewhat removed it is almost invariably surrounded by a mass of dark cells, similar to the cells of the ovarian stroma—and these stain with Sudan III as do the interstitial cells of the stroma of the ovary. So that its proximity or remoteness from the ovary is no criterion as to its origin.

Moreover, if further proof were needed, there are incontrovertible arguments in the facts that embryology shows its origin from the germinal epithelium, and in fœtal life the presence in the rete of primordial ova only tends to accentuate that origin; and in the adult cow the reversionary process all the more strongly goes to show that even after years of functionless life it is able to take on again (though imperfectly) its primordial function. Moreover, if further proof were necessary, I have one case (a human fœtus) in which the downgrowing rete ovarii has not yet reached the glomeruli of the Wollfian body. When these two do meet the contrast is marked, the one—the rete ovarii—is an actively growing structure with all the characters of actively growing tissues, whereas the parovarium stands out in marked contrast as a true glandular structure in advanced stages of degeneration.

I have insisted strongly upon the germinal origin of all these structures for two reasons: firstly, because it is contrary to all writing upon the subject, and secondly, because it gives us a new view as to the knowledge and origin of tumours of the ovary. It has been advanced as an argument against my tenets that if the ovary and testicle are so similar why is it that tumours of the ovary are so common and that tumours of the testicle are so relatively uncommon. The answer is not difficult to find. The testicle is a finished organ which contains nothing superfluous. The ovary is vulnerable because it contains so much that is not necessary to its economy. Every bit of such fœtal tissue is a menace to its welfare. That reversion types do take place there cannot be a question of a doubt. Why should one individual have a complete atrophy of all useless structures and another remain with a large amount of fœtal rests in her sexual apparatus? The question is difficult to answer. It seems at first thought plausible to assume that disease of the mother or of the fœtus in utero, whether of an infectious nature or of a metabolic character, might be the cause of this arrest of development. But upon careful consideration I am inclined to think that such developmental arrest is not only an idiosyncrasy but that it is atavistic in character. I have come to this conclusion from a close study of the incidence of ovarian new growths in families.

Be that as it may, the bilateral character of such rests cannot be gainsaid, and, struck with the frequency of bilateral new growths in the human, I undertook a search of the Royal Victoria Hospital records since 1902 to find the percentage of bilateral as compared with unilateral new growths. The tabulated results are as follows:

	Single	Double
Carcinoma ovarii	2	15
Malignant papilliferous cysts	7	22
	9	37

Cases in which one ovary is affected stand in relation to those in which both ovaries are affected in the ratio of one to four. This

bears out very strikingly the percentage of growths in other bilateral organs. It is almost a universal law in pathology that fœtal rests, when they occur in one of bilateral organs, almost invariably occur in the other; and this goes a long way to explain the frequency of bilateral malignant disease of the ovaries. That the growth in one ovary is not a metastatic deposit from the other hardly requires to arrest our attention. In the first place in the great majority of these cases the disease was in the early stage and the peritoneum had not been involved. Secondly, the majority of the cases were papillomatous (malignant) growths contained within a thick, intact cyst wall, and lastly, the lymphatic supply across the median line of the pelvis to the opposite ovary is minimal, and such a path could be open only in grave lymphatic obstruction. So that we are forced to the conclusion that malignant disease starts simultaneously in both ovaries and independently in each. The preponderance of multilocular glandular cystomata is markedly bilateral also, in the ratio of 7 to 22.

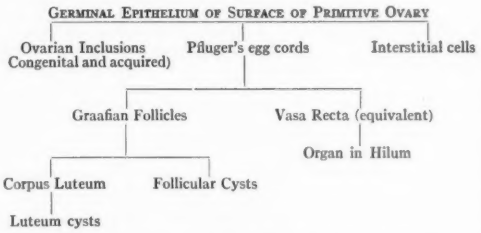
Against this theory that these are all derivatives of the germinal epithelium many authors advance the argument that many of these growths are so varied in structure and in the function of their cells that they cannot arise from a single type of cell. This I consider one of the strongest arguments in favour of this mode of origin. I myself have found early papillomata in small cysts deep in the ovarian stroma and in the immediate neighbourhood solid strands of cells which left no doubt that these were embryonic "rests" from the earlier ovarian system of ducts. Moreover, many cases are on record of innumerable cysts pervading both ovaries and establishing connection between the remains of the rete ovarii on the one hand and with the germinal epithelium on the other. I will deal with these at greater length in the larger work.

I have found, in many young adults and fœtuses and new-borns, invasions of the ovarian stroma by the germinal epithelium which in parts had taken on a true glandular type. Some were cysts, other portions were devoid of cysts, but all formed one chain the direct continuity of the links of which could be established easily in serial sections. Some portions of these contained tall epithelium of the columnar type, others were lined by goblet cells—true mucous cells; others again were ciliated, and lastly, several undilated parts had all three types of cells in the one small cyst wall. In other cases I have found true funnel-shaped invasions of the ovarian stroma by the germinal epithelium, these communicating freely with the peritoneal cavity, and their epithelium was continuous at their margins with the surface of the ovary. Yet these were lined by large goblet cells. This diversity I have stated has been advanced against the germinal origin of tumours. In return I wish to state that I know of no other epithelium in the human body which possesses such wonderful metaplastic properties. But our wonder ceases when we consider that the same germinal cell in its true physiological process does give rise to such widely different end products as the ovum, the cells of the membrana granulosa, the ciliated ducts of the rete ovarii, and lastly, as I will show, the interstitial cells of the ovarian stroma.

The fact that many tumours contain cilia seems an insuperable barrier to some. To this I may state that the cells of the rete ovarii are frequently ciliated, and I have found not only cavities which open freely upon the surface of the ovary lined by ciliated epithelium but have found isolated portions on the surface of the human ovary which were covered by ciliated epithelium. Frommell found one case in which both ovaries were completely covered with ciliated epithelium, and we cease to wonder when we learn that in many of the lower vertebrates the ovarian germinal epithelium is normally ciliated.

It will have been seen that all the structures which are always normally found in the ovary and all the structures which are occasionally found in the adult ovary, with the exception of the supporting stroma, are of germinal epithelium origin, and I have endeavoured to tabulate these to show the structures which persist normally and the structures which atrophy and disappear normally, and lastly, those which should disappear but which fre-

quently remain. It is a table therefore drawn according to genetic relationships. I have placed these in different types, namely: embryonic and representing a transitory stage, in italics; of normal development, in ordinary type; occasionally persistent, in Clarendon or leaded type:



So far in my studies, I have come across no elements imbedded in ovarian tissue that I can associate with parovarian "rests." If in this development the cell cords of the rete ovarii are found associated with the mesonephros, it now must be generally acknowledged that these originate primarily from the germinal epithelium and only secondarily gain the communication in question. All, whether directly or indirectly, are of germinal epithelial origin. The future doubtless will suggest an appropriate name for the organ in the hilum here described. To speak of it as a persistent Pfluger's tubule (or, more accurately, "egg cord") would only breed confusion. I have adopted the term "rete ovarii" to show its analogy. We should, that is, continue to regard the Pfluger's cords as a transitional stage in the development of normal Graafian follicles. The whole of this system with its central main cavity or sac, its papillomatous in growths and series of abortive Graafian follicular outgrowths, is something more than a persistent cord.

If this view be correct, and all the epithelial structures seen in the ovary are derivatives of the germinal epithelium, it follows as inherently probable that tumours of epithelial type primary in this organ are aberrant overgrowths from this germinal epithelium. I need not here discuss the tumours of non-epithelial type, the sarcomas, or one order of these, which may possibly arise from the interstitial cells; nor again the teratomas (ovarian dermoids) arising presumably from totipotential cells of the order of oöcytes, save to note in passing, that this observation that the senile germinal epithelium may as a reversionary process take on the property of affording oöcytes, is absolutely at variance with Bonnet's and Beard's teaching, accepted by many writers, that the oöcytes are not directly derived from the mesoblastic cells of the germinal ridge, but from germinal blastomeres which wander into the organ during the course of its development.

Two questions at once suggest themselves: Do all the growths of the ovary arise from acquired post-natal structural defects? Or do they spring entirely from fœtal rests? This is one of the most difficult questions to answer fully, but a partial answer can be given with greatest certainty. Tumours do arise from structures other than fœtal rests in the ovary. I have found in nearly every ovary of women past 35 years a dipping of the germinal epithelium into deep crevices over the whole surface of the ovary. In many cases this is funnel-shaped; in others the point of entry is small and the deeper portions expand into a cavity. In others the communication with the surface becomes constricted and the structure is then converted into a cyst. In these I have found all types of epithelium from the flat inconspicuous epithelium through the syncitial type and the mucous goblet type to the tall ciliated celled lining. I was for a time at a loss to explain the cause of the inward traction or invasion by the germinal epithelium, but serial sections soon afforded a complete explanation. In the ovaries of women in the third decade the more recent of these invasions were invariably associated with almost completely resolved corpora lutea and the shrinking of this was almost invariably followed by a drawing in, at times to considerable depths, at the point where the corpus comes nearest to the surface of the ovary. I will be able to show that in the woman after 35 years the resolution of the corpora is less rapid, less complete, and the consequent fibrosis and scar and shrinking are much greater than in younger people, and that in the child resolution is complete without

shrinking or mutilation of the ovary or of its surface.

This is one type of acquired new growth, and another but of less importance is that given by Nagel, that chronic inflammation of the ovary causes downgrowths of the germinal epithelium and subsequent tendency to cyst formation. I have had ample opportunity to corroborate Nagel's findings but my interpretation is very different. When the ovary becomes covered with organised lymph and inflammatory products it has been the experience of every gynecological pathologist to find the ovary devoid of epithelium in places but covered with germinal epithelium in other parts. From the denuded surface of the ovary the fibrous tissue invades the perioöphoritic depŏsit, but the areas which are still covered with epithelium reflect the epithelium onto the overlying exudate and thus form cysts. This is a very common finding and, by following the direction of these small cysts, one can in many easily define the original boundary of the ovary. So far Nagel and I agree in our interpretations. But when he states that these cysts show a marked tendency to invade the ovarian stroma, then I must take issue with him. I have never found that to occur, but have found that such invasions are similar to thŏse which I have described above — intractions owing to cicatrices — and we can readily understand how much more readily this does occur when inflammatory processes have greatly changed the ovarian stroma and have complicated the normal involution of the corpus luteum.

One other origin of new growths must be mentioned: We frequently find both fœtal and child's ovaries markedly lobulated, and the sinking of the germinal epithelium into this primitive deep cleft does give rise to cysts of all kinds. I have found not a few of these and they fall into the class of the neoplasms of congenital origin. With regard to the Graafian follicles I have failed to find any indication that these give rise to tumours proper, and accept the general teaching that their conversion into cysts is secondary to atresia and death of the contained oöcyte — a degenerative and not a vegetative process — and therefore in itself unlikely to give place to neoplasmic growth, their nature is passive rather than active. A simple cyst, I may point out, is not a neoplasm. The relationships of the corpus luteum are somewhat different. The observations of Franckei and of Marshall and Jolly demonstrate that its cells function actively during at least the early stage of pregnancy. But at the same time those cells, proliferating, completely lose all indications of an epithelial arrangement; there is developed nothing of the nature of a basement membrane. I am inclined to lay down that if at any time they give rise to a neoplasm, then, like the interstitial cells, they produce what is histologically a sarcoma rather than an adenoma or carcinoma. When cysts of the corpus luteum do occur my experience has invariably been that they are secondary to either infection with abscess formation (gonorrhœal), or secondary, to liquefaction of a large hematoma of the corpus. Hence they are mere retention cavities which must eventually undergo absorption.

With regard to the interstitial cells of the ovary, recent investigation, which my work corroborates in almost every detail, shows that there are two types of interstitial cells in the ovary. There is the adult fibrous tissue, fibrillated and poor in nuclei, and there is the small embryonic cell with a large deeply staining nucleus. The former abounds in the hilum and is merely the supporting binding structure; the latter is the parenchyma of the ovary. Several French authors have shown the origin of the latter cells from the germinal epithelium. My sections leave not the slightest doubt as to the origin of these. They are all of germinal origin. And this brings us to the last part of my work and perhaps the most interesting.

The ovary possesses two secreting structures: (I) the corpus luteum, and (II) the interstitial or parenchymatous cells of the ovary. If we stain sections of the ovary of an adult at the height of her sexual life we find many corpora lutea either in the stage of development or in the stage of atrophy. Another such section stained for fat, shows the lutein cells filled with fat; but in addition

there are fat-containing cells scattered about the whole ovarian stroma. If now we stain another section from the ovary of a woman in the first months of her pregnancy we find not only is the corpus luteum of pregnancy large and filled with fat but the tunica vasculosa of every other Graafian follicle, large or small, is converted into a mass of lutein cells, and millions of interstitial cells throughout the ovary are filled with fatty secretion. Moreover, one remarkable specimen of the ovary of a pregnant rabbit is converted almost wholly into fatty cells, and the true lutein cells are distinguishable from the fatty cells of the parenchyma only with the greatest difficulty. Even then the difference is only one of size, which is very slight indeed.

Is the secretion from the corpus luteum similar to that of the interstitial cells? This I cannot answer. But it is borne very forcibly home that the ovarian parenchymatous cell is the true continued internal secretory structure of the ovary and that the development of the corpus luteum is a special structure (perhaps similar to the former) for a special purpose — reproduction.

The germinal origin of the stroma of the ovary affords a very plausible explanation for the frequent development of endotheliomata of the ovary. I have been struck with the relative frequency of the endotheliomata of the ovary as compared with the sarcomata; the relation is about 8 to 1 respectively. Now, the endotheliomata are tumours which occupy an intermediate place between the carcinomata on the one hand and the sarcomata on the other. In fact in many instances the one tumour will show transitions to the two extremes, so that a classification becomes impossible. The parenchymatous cell of the ovary having developed to the type of germinal epithelial cell and then having reverted to a special connective tissue cell with a secretory function, does occupy a place midway between the epithelial cell on the one hand and the mere adult-supporting, fibrous, tissue cell on the other.

This work upon the epithelial growths of the ovary brings out another fact, — that cancer has two agents in its production, a local and a general. The local cause we have found in congenital remains and acquired defects, but the general cause must be some constitutional, some diathetic change, which being general operates upon these fœtal and acquired structures and stimulates both ovaries into simultaneous malignancy. Why it is that these structures lie dormant for so many years, and then at a certain age take on activity, is difficult to explain. But the same holds good for cancer in other parts. Why should a laceration of the cervix create no disturbance for years and then at a given age be stimulated into cancerous growth? The answer is difficult, but I will be able to show that one of two things occur: Either the human body possessed in its fluids a something which inhibited the growth of these structures, and upon its withdrawal at a certain age the inhibiting force was removed, or there was throughout life an absence of something the formation of which at a later period of life stimulates into activity structures which are prone to take on aberrant growth.

I hope to show that this change which makes new growth possible is one that is closely interwoven with the function of the ductless glands.

SUMMARY

The foregoing pages may be summarized as follows: That in the human fœtus the testicle and ovary develop analogous effecent vessels; that Pfluger's egg cords, vasa recta, rete ovarii, parovarium and Gartner's duct (divided into proximal and distal, relative to the ovary) are analogous with the seminiferous tubules, vasa recta, rete testis, vasa efferentia, epididymus and vas deferens respectively; that these are all of germinal epithelial origin; that in the female in the lower vertebrates many of the structures of the fœtal ovary persist, which in the higher types of vertebrates undergo absorption; that in the human the rete ovarii and the vasa recta normally disappear; that in the human vestiges of the rete ovarii are found in one out of eleven cases; that when present in one ovary it is nearly always present in the opposite organ; that remnants of the vasa recta frequently persist in certain individuals and are more prone to occur in those who have

persistent rete ovarii; that these structures, though somewhat atrophied, are always found in the adult cow, sheep, pig, rabbit, dog, guineapig, and cat; that in the aged cow these structures may show their germinal origin by developing abortive ova and abortive Graafian follicles; that instability of fœtal rests may readily pass over into new growths; that the surface epithelium frequently invades the ovarian stroma, due to lobulations of the fœtal ovary; that all the foregoing epithelial structures of the ovary are of congenital origin and may be the starting points of new growths; that owing to cicatrization of corpora lutea the germinal epithelium may be drawn deeply into the ovary; that chronic inflammation of the ovary predisposes to cyst formation; that these two last conditions are acquired sources of new growth; that the germinal epithelium possesses wonderful metaplastic properties; that from the same germinal epithelial cells the ovum, the cells of the membrana granulosa, the interstitial parenchymatous cells of the ovary, ciliated, mucous goblet, syncitial, and cuboidal cells may develop; that the interstitial parenchyma of the ovary is of germinal origin; that the ovary possesses two structures adapted to internal secretion, the corpua luteum and the parenchymatous cells; and lastly, the frequency of endothelioma of the ovary as compared with true sarcoma is probably due to the mesothelial origin of the interstitial parenchyma of the ovary.

For a full bibliography I must refer the reader to the fuller text.

CHRONIC VISCERAL PAIN IN RELATION TO SURGERY AND PSYCHOTHERAPY [1]

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AMERICAN surgeons and gynæcologists have at last decided almost unanimously that the "neurasthenia" accompanied by visceroptosis is not at all benefited by operative replacement. But Dr. Mayo (Congr. Amer. Phys. and Surg., May, 1910) confesses himself at a loss what to do with such patients, as most of them were sent him by neurologists who had failed to relieve their sufferings. He thought that "something like Christian Science" might be the best thing. Only last year, indeed, a United States senator, in speaking against the proposal to unify all present federal medical agencies, pleaded dramatically for the cult which had restoredto health his wife and self, both invalids of long standing, whom doctors had failed to improve, and his son, a dipsomaniac, with whom, also, regular doctors had failed.

But the answer to Dr. Mayo's question is not a negation of the facts of the world like Christian Science, but a measure based upon rational psychology and a grasp of the genesis of hysterical fixed ideas and psychasthenic obsessions and phobias. The following cases show the simplicity of the procedure when the principles of diagnosis and treatment are understood; and that as Brissaud said, in the cases of both of the hysteric and psychasthenic algias: "Better give psychomotor discipline before a surgical operation, if it is to be needed after it."

Case 1. Hysterical appendicitis of three months duration cured by psychotherapeusis after failure of surgery. A girl of twenty years was referred by Dr. Watkins and Dr. Stavely because of recurrences of right iliac pain with nausea and vomiting, but with normal temperature and pulse, since three months. Two months before, the appendix had been removed for similar symptoms, and found little changed, though containing a concretion of lime. At the time, the ovaries and gall-bladder were found normal. The pains recurred every few days and lasted some hours, and were relieved by morphine or the Scotch douche.

[1] Read before the Washington Surgical Society, November 17, 1911. See discussion, p. 643

Examination showed only a psychogenic hyperæsthesia in the right iliac fossa, controllable by direct suggestion. Some colonic atonia, a slight retroversion and intestinal sand could not explain a manifestly psychogenic tenderness. So, after a few days, Dr. Watkins, armed by conviction derived from the consultation, entered the fray, and after a struggle of nearly two hours convinced the young woman that determination to conquer a longing for the comforting and anodynes which sickness brings would cure her. She went back to Illinois next day, and remains well.

Such rapid success is not common. The following similar case illustrates the need of persistence in persuasion.

CASE 2. Coccygodynic neurasthenia from hysteria. A woman of thirty-four years was referred by Dr. Lemon because unbenefited by uterine suspension, amputation of the coccyx, and other gynæcological measures. She was lying stiffly in bed for fear of hurting the coccyx, with intense right iliac pain and tenderness. I found the latter modifiable by suggestion, as was the stiffness. There was a false, i. e., volitional, Kernig's sign; and the reflexes were sluggish. She wore the martyr smile, but professed anxiety to recover and go to work.

Her condition was manifestly psychogenetic; but her sister's belief in its organic nature hindered recovery, in spite of the persistency of Dr. Lemon. But, at my instigation, he kept persuading, until after four months finally improvement began; and one day the young woman determined to put it to the proof, went to work, succeeded in the fierce struggle against giving way, and is now more capable than she has ever been before.

CASE 3. Hysterical spasm from appendicitis; secondary neurasthenia; cure in two weeks by reeducation. A case, intermediate as to duration of treatment, was seen recently with Dr. I. S. Stone. The patient had had a dull pain since an attack of appendicitis six years before; but had gone on working in her dairy, in spite of it, until it wore her out. After this, a spasm of the iliac muscles supervened. She declared herself nervous because she suffered so intensely. She would start at noises, and could not sleep after excitement; so that she gave up visiting her friends. The only neurological signs were the hyperæsthesia and spasmodicity in the right iliac region.

Treatment. I taught her to inhibit the spasm by drill, and assured her that the hyperæsthesia would disappear as a result of the operation which Dr. Stone had performed three weeks before. But as the spasm had become a habit, and gave rise to pain by stretching the muscles, she would have to learn to control it by means of a series of exercises in muscular inhibition, which I showed her how to perform. She made quick progress at first; but relapsed on account of a physical depression, which I found to be due to disordered metabolism from the egg and milk diet which her recumbent posture did not enable her to metabolize. When this was rectified, the psychomotor discipline was again persevered with, and she returned home, almost well, two weeks after I saw her.

Skill in the technique of psychotherapy is not hard to achieve after psychopathological data have been acquired. But to attempt psychotherapy without knowing to what it is being applied is as fatuous as the grossest empiricism in any other part of medical or surgical art. "Just as the surgeon requires, first, a minute knowledge of anatomy and pathology; second, the good sense to apply this knowledge clinically; third, acquaintance with, and a practice of, technical advances in his art; so, the psychotherapeutist requires, first, a minute knowledge of psychology and psychopathology (I exclude here all metaphysical notions, which unfortunately are rife in much of which has been written on psychological medicine); second, the acumen to use this knowledge clinically in diagnosis; and, third, an acquaintance with, and the practice of, technical precedures as they improve."

As the cases show, the principle of the treatment is to teach the patient to use the disabled part in spite of the tenderness excited. This requires training; and it is the doctor's duty to give it, himself or through a nurse. Of course, discretion must be used not to apply this treatment to the pain of active inflammation. Again, there are times when a patient should not be urged; such as case 3 shows. It is in such contingencies that lay psychotherapy is palpably defective. I cannot here enter further even into the principles which should guide the physician as to when to urge and when to rest the patient. Psychological tact and experience can hardly be inculcated in a short space. The reader who is interested may consult Nursing for the Neurologist (The Trained Nurse and Hospital Review for June, 1910); Cases Showing the Origin of Hysterical and Pseudo-Hysterical Symptoms (American Journal of the Medical Sciences, August, 1910); forthcoming paper on Treatment of Hysteria (Jour. Nerv. and Ment. Dis.), also the Functions of the Neurologist (Medical Record, 1911).

THE NEWER OPERATIONS IN GLAUCOMA[1]

By JOHN E. WEEKS, M. D., New York City

EVER since the epoch-making discovery of von Græfe, that iridectomy served, in many cases, to lessen the tension of the eyeball, and his application of the operation to the cure of glaucoma in 1856, it has been the observation of ophthalmologists that iridectomy was effective only in a portion of the cases, and effort has constantly been made to discover methods that would give desirable results in all cases. It has been observed that the classical iridectomy of von Græfe has, on the whole, been the best *general* operation, that in nearly all cases of acute glaucoma it sufficed. In chronic cases it often failed. It was found that cases which because of entanglement of iris or some other tissue, or of some fault of performing the operation, a cystoid scar formed, more lasting beneficial results were obtained than from iridectomy.

It was found that paracentesis of the anterior chamber well back in the iris angle, that posterior sclerotomy, and that partial detachment of the ciliary body brought about a more or less lasting lowering of the intra-ocular tension. These observations enlisted the inventive interest of many ophthalmic surgeons and brought out a number of procedures more or less well adapted for the accomplishment of the purpose desired. All of the operative procedures have for their object the reduction of the intra-ocular tension to the normal and the maintenance of the tension at, or below, this point. On examining the literature of this subject, it becomes evident that we can conveniently include nearly all the operations for glaucoma, other than the classical iridectomy, under the term, "the newer operations for glaucoma," since all but a very few have been brought forward in recent years.

The direct results of the forms of surgical intervention employed, whether so understood by the projectors of the operations or not, may be grouped as follows:

1st. To remove a portion of the vitreous body, or to permit the aqueous to escape.

2d. To form a permanent communication between the aqueous chamber and the perichorioidal lymph space.

3d. To form a permanent artificial avenue for filtration from the anterior chamber to the exterior of the eyeball:

a. By the formation of a cystoid scar with incarceration of the iris or other tissue.

b. By the formation of a filtering cicatrix without incarceration.

4th. To so influence the secretion into the eye that an excess will not occur.

5th. To relieve pain by cutting off the sensory nerve supply to the eyeball.

Under the first division may be placed:

1. Posterior sclerotomy.
2. Trephining back of the ciliary zone.
3. Sclero-ciliotomy (Hancock).
4. Paracentesis of the anterior chamber.
5. Anterior sclerotomy (de Wecker).

Under the second:

1. Cyclodialysis (Heine).
2. Sclero-ciliotomy.
3. De Vincentiis' operation.
4. Sclero-choriotomy (Querenghi).

Under the third:

1. Fistulous cystoid cicatrix.
2. Anterior sclerotomy.
3. Filtering cicatrix.
4. Trephining (Holth, Major Elliott, Verhoeff, Fergus).

To the fourth belong:

1. Section of the cervical sympathetic (Abadie).
2. Resection of the superior cervical ganglion of the sympathetic (Jonnesco).

To the fifth:

1. Stretching of the supra-trochlear nerve (Bailey).
2. Laceration of the infra-trochlear nerve (Badal).
3. Optic ciliary neurectomy.

Posterior sclerotomy (paracentesis of the posterior chamber). Ordinarily, posterior sclerotomy is performed in the lower outer

[1]Read before the Clinical Congress of Surgeons of North America, Philadelphia, November, 1911. See discussion, page 640

quadrant of the sclera, anterior to the equator of the globe, and sufficiently far back to avoid wounding the ciliary body. The incision should stop at least 6 mm. from the corneal margin. Local anæsthesia is employed. The lids are held apart by a wire speculum. The ocular conjunctiva and subconjunctival tissues are grasped with the fixation forceps opposite to the point where the incision is to be made, and the eye is rotated so as to expose the site of the incision. (It is convenient to pass a silk suture through the ocular conjunctiva and episcleral tissue at the margin of the cornea next to the incision, as a guy suture, to be held by the assistant, in place of the forceps, to control the rotation of the eye.) A meridianal incision is now made through the ocular conjunctiva and subconjunctival tissues, laying bare the sclera. If desirable, the margins of this wound may be separated by means of retractors. A Græfe knife is employed. The incision through the sclera should be meridianal, beginning anterior to the equator of the globe and extending toward the center of the cornea a sufficient distance (3 to 6 mm.). If designed to precede iridectomy, a short incision is sufficient; a drop of vitreous is permitted to escape. When performed for the relief of pain and decrease of tension in absolute glaucoma, it is best to make the incision longer and to convert it into a T-shaped incision by turning the knife and making a short arm (about 1 to 2 mm.) at right angles with the meridianal incision. A few drops of vitreous should be permitted to escape. In completing the operation, the vitreous that protrudes may be excised, and the ocular conjunctival and subconjunctival tissue sutured over the scleral incision. If the sclerotomy is preliminary to iridectomy, the knife may pierce the conjunctiva and subconjunctival tissue.

Trephining the sclera (posterior to the ciliary zone). In 1869 Mr. Bowman (Soelberg Wells, 3d American Ed., page 178) designed a trephine made by Weiss in three sizes, which he used to excise a piece of the cornea at the apex of the cone in conical cornea (Fig. 1).

In 1876 Argyll-Robertson (R. L. O. Hospital Reports, vol. viii, May, 1876) described what he termed "A New Operation for Glaucoma." With a hand trephine he drilled a hole 2 mm. in diameter through the sclera above the junction of the ciliary processes with the chorioid. Argyll-Robertson reported four operations. In the last two the conjunctiva was raised before trephining and replaced afterward, covering the defect. He believed that in the operation described ophthalmic surgeons possessed "an efficient means of reducing intra-ocular tension." Argyll-Robertson advocated the employment of trephining only in cases in which iridectomy had failed or could not be performed.

In 1903 Dr. Blanco of Madrid (Klin. Monatsbl. f. Augenheilk., xli, 2, p. 150, 1903) advocated the removal by trephining of a circle of sclera, chorioid and retina 4 mm. to 5 mm. in diameter from all blind and painful glaucomatous eyes.

Dr. Konrad Fröhlich (Klin. Monatsbl. f. Augenheilk., May, 1904) recalled the operation and wrote in favor of a return to trephining the sclera in cases of painful eyes with absolute glaucoma.

Operation. Two incisions were made through the bulbar conjunctiva 10 mm. to 12 mm. long, one along the lower border of the external rectus muscle, and one along the outer border of the inferior rectus muscle. The limbal attachment of this strip of conjunctiva was severed and the flap turned back, exposing the sclera. Then by means of a Von Hippel trephine (Fig. 2) a disc of sclera 5 mm. in diameter was excised just back of the ciliary body. The underlying tissues, chorioid and retina, were left uninjured. The conjunctival flap was then replaced and held in position by means of sutures. Fröhlich reports five cases. Recovery ensued in ten to fourteen days, except in one case in which the chorioid and retina were injured, profuse hæmorrhage caused loss of the eye.

The writer has found the operation of posterior sclerotomy to be of value for the permanent relief of tension and pain in absolute glaucoma in the five cases in which he has employed it. He has not practiced the operation of trephining the sclera posterior to the ciliary zone.

Sclero-ciliotomy. Hancock (Moorfield's Reports, vol. iii, p. 13, 1860) under the

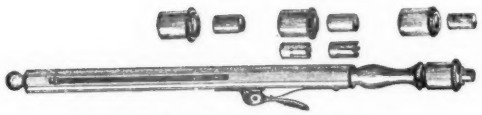

Fig. 1. Bowman's trephine.

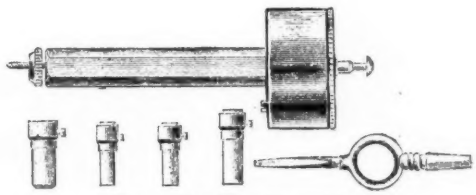

Fig. 2. Von Hippel's trephine.

supposition that because of atrophy or spasm of the ciliary body the circulation through the vessels of the chorioid was impeded and thus caused increased intra-ocular tension, incised the sclera and divided the ciliary body.

Operation. This operation, as performed by Hancock for the cure of glaucoma, 1860 (see Fig. 3), consists in plunging a Beer's knife into the globe at the lower sclero-corneal junction, directing the point backward and a little downward (the cutting edge downward), making a meridianal section that opens the anterior and posterior chambers, divides the ciliary body, and enters the vitreous chamber. The incision is made 4 to 5 mm. long and is in the sclera. As the knife is withdrawn, it is turned slightly, permitting escape of the aqueous and some vitreous. The operation has not met with general favor, but Pollak (Am. Jour. of Ophthal., March, 1899) reports having operated in this manner "between sixty and seventy times without a single failure."

Abadie (Ophthalmoscope, July, 1910, p. 501) argues that irritation of the ciliary region may provoke glaucomatous accidents, as in certain forms of chorioido-retinitis affecting the equatorial region. Convinced that irritation of the rich circular nervous plexus which covers the ciliary zone immediately behind the insertion of the iris might induce a glaucomatous condition, he thought that in certain forms of glaucoma the division of the nervous circle might have an action comparable with the division of the nervous circle of the iris." In discussing the reason for the favorable effect of iridectomy on glaucoma, Abadie writes, "I believe that the division of the iris, necessarily including section of the nervous plexus which runs through it, suffices to cure glaucoma." The operation, which is virtually that of Hancock, is termed cil-

iarotomy. The technique is as follows: An incision 1½ cm. in length is made through the conjunctiva and subconjunctival tissue, meridianally, in the upper outer quadrant of the globe, beginning at the corneal margin and extending toward the equator, laying the sclera bare 7 to 8 mm. By dissection the sclera is exposed. Two sutures are passed through the conjunctival flaps so that they may be united over the scleral incision as soon as it is completed (see Fig. 4). The eye is then fixed with the fixation forceps and the point of Richter's triangular knife is inserted at the junction of the sclera and cornea, immediately behind the insertion of the iris. The knife is plunged into the globe, the point being directed toward the center of rotation, and a meridianal incision 7 to 8 mm. in length is made through the sclera and ciliary zone. Division of the ciliary zone is the essential part of the operation. The knife is then withdrawn. Commonly one or two drops of vitreous escape. The conjunctival flaps are then brought together and secured in place by means of the sutures.

Abadie is of the opinion that the operation is of great value in cases of absolute glaucoma with painful globes, and in cases in which the disease continues to advance after iridectomy has been performed. The operations of Hancock and Abadie not only divide the ciliary body, but they permit the loss of some vitreous and serve to connect, more or less permanently, the aqueous and vitreous chambers and the peri-chorioidal lymph spaces.

Walker, of Liverpool (Essays in Ophthalmology), divided the ciliary zone in the following manner: He passed a narrow Græfe knife through the cornea near the sclero-corneal margin, the cutting edge being directed away from the axis of the globe. The point of the knife was thrust through

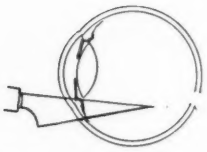

Fig. 3. Hancock's operation.

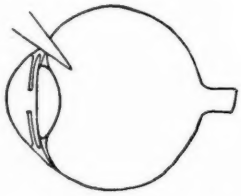

Fig. 4. Abadie's operation.

the base of the iris and through the zonula, avoiding the lens and entering the eye almost to the ora serata. On withdrawing the knife, the surgeon cut through the chorioid and ciliary body down to the sclera, enlarging the corneal wound as little as possible.

Sclero-choriotomy. Querenghi (Annal d'Oculists, June, 1900, and July, 1901), in an operation that he calls sclero-choriotomy, modifies the operation of Walker by entering the globe through the sclera. His operation is advocated on the theory that glaucoma depends on a want of free communication between the peri-chorioidal space and the anterior chamber.

Operation. A puncture through the sclera 2 mm. from the corneal margin is made with a narrow Græfe knife, the cutting edge being directed posteriorly; the point of the knife is made to enter the posterior chamber; then, by depressing the handle, the point is carried beyond the ciliary body and, on withdrawing the knife, the ciliary body is divided down to the sclera. A sawing motion is employed and care is exercised not to enlarge the original opening. The incision is supposed to make a free communication between the peri-chorioidal space and the anterior chamber, and to avoid the danger of prolapse of the iris.

The two operations just described produce the same effect on the tissues as do the operations of Hancock and Abadie, except that they do not permit the escape of vitreous. The writer has had no personal experience with any of the operations that include division of the ciliary body.

Paracentesis of the cornea for the relief of intra-ocular tension is of temporary value in cases in which immediate iridectomy, or other operation, is not convenient or desirable. As in some cases of hæmorrhagic glaucoma and in some cases of acute glaucoma in which the anterior chamber is not abolished; in some cases of plastic iritis with increase of tension due to plugging of the spaces of Fontana by the plastic exudation. The operation is of such antiquity and so well known that it is unnecessary to further allude to it here.

Sclerotomy. In 1867, de Wecker, considering iridectomy harmful, preferred anterior sclerotomy because he believed that it facilitated the escape of aqueous and consequently secured permanent reduction of intra-ocular tension. He insisted that the scleral wound must be free of iris.

Operation. de Wecker's procedure briefly is as follows: Local anæsthesia is employed. A drop of ½ per cent solution of eserine sulph. should be instilled into the eye some minutes before the operation. The puncture and counter-puncture should be made 1.5 to 2 mm. from the corneal margin in the sclera (see Fig. 5) in order to enter the filtration angle, and should include about two-fifths of the circumference of the globe at this plane. The incision may be either above or below the horizontal meridian. It should be slowly enlarged in the same plane until the sum of the two incisions aggregates the length of the incision for iridectomy; namely, 7 to 8 mm., leaving a thin bridge of sclera at the apex. The knife is now turned on the flat, and the aqueous is permitted to escape slowly. When this is accomplished, the knife is withdrawn, care being observed not to permit the prolapse of the iris. If prolapse occurs, the iris should be carefully replaced (in cases where this cannot be readily accomplished, the iris may be excised). A drop of ½ per cent solution of eserine may now be instilled and a compressed bandage applied.

Querenghi performs sclerotomy. He uses a keratome, entering the anterior chamber well back in the iris angle. An incision of 6 to 7 mm. is made. He claims that it is easy to prevent prolapse of the iris if the knife is withdrawn slowly and the iris is pressed gently during its withdrawal.

Bjerrum's sclerotomy. (L'Ophthal. Provinciale, March, 1909.) Bjerrum uses a narrow Græfe knife with a thick back and a double-edged point. The puncture and counter-puncture are made at the limbus and the knife is made to cut obliquely so that the incision is finished 3 to 6 mm. from the corneal margin. The incision is rendered subconjunctival by making the *conjunctival* puncture and the counter-puncture some distance from the limbus. In operating on the right eye, he stands behind the patient and makes the section downward, coming out below the cornea; for the left eyer, he stands in front, making the section upward, the knife emerging above the cornea. On completion of the operation the iris is often slightly displaced, rendering the pupil oval, the long axis parallel to the incision. If tension is not normal a week after the operation, massage by pressure on the cornea through the upper lid is resorted to. Commencing on the fifth to seventh day, massage as described, one minute at a time each day, is continued as long as is thought desirable. Bjerrum reports good results.

Cyclodialysis (Heine). Operation:

Stage 1. The sclera is exposed 5 to 8 mm. from the corneal margin by dissecting up the conjunctiva.

Stage 2. An equatorial incision 2 mm. long is made obliquely forward through the sclera, 5 to 8 mm. back of the corneal margin. The incision passes through the sclera only (Fig. 6).

Stage 3. The end of the spatula is then passed through the wound, kept in contact with the sclera, and passed forward through the annular ligament and ligamentum pectinatum until it appears in the anterior chamber. By lateral movements the ligament is ruptured to the desired extent, separating ciliary body and iris from the sclera.

Stage 4. The spatula is withdrawn (a) without permitting much escape of aqueous, in which case the tension is not reduced at once; (b) the spatula is rotated in withdrawal and aqueous escapes, reducing the tension.

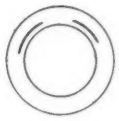

Fig. 5. De Wecker's anterior sclerotomy.

By this operation the peri-chorioidal space and the anterior chamber are made to communicate. Some irritation of the eye may follow and hæmorrhage into the anterior chamber may occur. The first rapidly subsides and the second is soon absorbed.

Results. The results of this operation as studied by G. Weinicke (Klin. Monatsbl. f. Augenheilk., November and December, 1908) in the analysis of sixty-one patients, on whom cyclodialysis had been performed seventy-six times, are as follows: The cases were, acute glaucoma, nine; hæmorrhagic glaucoma, four; subacute, chronic or absolute glaucoma, thirty-one; simple glaucoma, nine; traumatic glaucoma, two; bulphthalmos, seven. Many of the cases were reported after a lapse of years. In 57 per cent there was improvement as long as the cases were under observation; in 25 per cent, temporary improvement; in 18 per cent, no improvement. Of the 18 per cent, nine were improved by subsequent cyclodialysis.

Recently Dr. Fergus of Glasgow, Scotland, has devised an operation in which cyclodialysis is a prominent feature. Dr. Fergus demonstrated his operation before the Ophthalmological Congress at Oxford, in July, 1909, and the Ophthalmological Section of the British Medical Association at Belfast in the same month (Ophthalmoscope, Feb., 1910). Technique of the operation: A conjunctival flap is dissected up and laid over the cornea. With a medium size Bowman's trephine a disc of sclera is removed from just posterior to the annular ligament of the ciliary body. At the first operations the conjunctival flap was restored at this stage and the operation was at an end. In all subsequent operations after the disc of sclera was removed Fergus

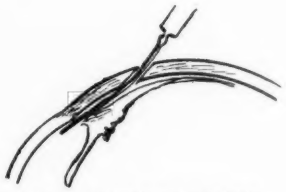

Fig. 6. Heine's cyclodialysis.

passed an iris repositor in at the scleral opening, keeping the point close to the inner surface of the sclera and cornea until it appeared in the anterior chamber. The repositor was then removed and the conjunctival flap was replaced and stitched into position. Dr. Fergus does not believe that there is any danger of the development of sympathetic inflammation following the operation.

It has been held by some ophthalmic surgeons that relief of tension may be obtained by a free communication between the anterior and vitreous chambers. For the purpose of establishing such communication, Hern (Ophthal. Congress, Utrecht, 1899) advocated the following operation to be employed when iridectomy has not relieved the tension. Instruments: A narrow, double-edged knife about 1 mm. broad; a speculum and fixation forceps may also be employed.

Operation. The knife is passed through the cornea 2 mm. from the corneal margin, the plane of the blade being parallel with the horizontal plane of the eyeball. The knife passes through the coloboma, through the suspensory ligament above the lens and into the vitreous. By lateral movements the suspensory ligament is divided to the largest possible extent. The opening through the zonula thus establishes free communication between the vitreous and anterior chambers.

Rochon Duregueaud (Gaz. des Hopitaux, 1895) described an operation which he termed "reduced sclerotomy." He makes a puncture and counter-puncture with a linear knife near the horizontal meridian in the sclera 1.5 mm. from the margin of the cornea. He then withdraws the point of the knife into the anterior chamber and describes a semi-circle, cutting the tissue in the iris angle. The puncture is not enlarged.

De Vincentiis (Annal di Ottal., vol. i., p. 540, 1894) described a similar operation under the name "incision of the iris angle." He uses a special sickle-shaped needle, so constructed that the aqueous will not escape during the operation.

Operation. The sclera is pierced 1.5 mm. from the corneal margin, the anterior chamber entered, and the point of the needle carried across the anterior chamber to the opposite side, parallel to the plane of the iris. On withdrawing the needle, the tissues at the iris angle (ligamentum pectinatum) are cut and Schlemm's canal opened into. The incision is made as long as possible. Tailer (Lav. della clin. ocul. d. R. U. di Nap., iv, p. 197) reports sixty-two operations after de Vincentiis for glaucoma of various forms. The results were satisfactory. Sgrosso reports fifteen cases, eleven glaucoma simplex — tension and vision improved. There was a relapse in one case one month later.

OPERATIONS CONTEMPLATING THE FORMATION OF A CYSTOID CICATRIX, OR INCARCERATION OF IRIS OR CONJUNCTIVA

Major Herbert (Trans. Ophthal. Soc., vol. xxiii, 1903) has devised a number of operations all for the purpose of obtaining a cystoid filtering cicatrix. He made a large sclerotomy with a large conjunctival flap and produced a large prolapse of the iris. The wound healed, the prolapse being covered by the conjunctiva. As the iris tissue resisted the passage of fluids, he finally excised a small piece of iris, establishing a fistula at once. Herbert reported the results of 130 operations. In 13 the iris was left intact; in 5 iridotomy was performed; and in the rest iridectomy was performed. The relief of tension was certain and permanent, although in some cases this was not established until massage and miotics had been used for periods of two to three months. He held that the risk of late infection was small and that early serious complications were less frequent than in similar cases operated on by a broad iridectomy. Herbert claims that this method is better able to provide a permeable scar than any other. He admits that there is some risk of infection and that sympathetic oph-

thalmia may result, but that both are so infrequent that they may be disregarded.

In another series Herbert endeavored to obtain a filtering cicatrix by tucking a strip of conjunctiva into a scleral incision. A large conjunctival flap was made above the scleral incision and a fold of the flap was pushed into the wound, the apex of the flap lying on the sclera above the wound. When the anterior chamber reformed, a bulging of the conjunctiva above the wound took place and a more or less permanent fistulous cicatrix resulted. On account of the fact that the fold of conjunctiva did not always remain in place, Herbert later secured the inclusion of the conjunctiva by passing a suture through the middle of the conjunctival flap after tying the end of the two threads of the suture into a knot. The needle was then passed through the uppermost edge of the cornea and the threads were knotted on the surface of the cornea. The suture was removed at the end of twenty-four hours.

Denig (Ophthalmology, July, 1910), New York, describes an operation in which he draws a strip of conjunctiva 3 mm. wide and 2 cm. long, connected to the globe by a pedicle at the limbus, through the incision made in the sclera for the iridectomy and a parallel incision through the cornea 2 mm. from the limbus 3 mm. to 4 mm. long. After the iridectomy is made the strip of conjunctiva is drawn through and doubled on itself, so that the epithelial surfaces are in apposition. The flap is left attached at the limbus. The opening in the conjunctiva and the ends of the flap are covered subsequently by undermining and sliding the flaps. The operations are too few to warrant conclusions regarding results.

Holth (Annales d'Oculist, March, 1907) makes an incision either with a linear knife or with a keratome. With the former the incision is made 6 to 8 mm. long at the limbus with the formation of a conjunctival flap. With the latter the conjunctiva is pierced 8 mm. from the corneal margin in order to supply a conjunctival flap. The point of the keratome is advanced subconjunctivally to 1 mm. from the corneal margin, where it is made to pierce the sclera, and the incision 6 to 8 mm. long is made in this plane. An iridotomy or iridectomy is done, the iris drawn into the angle of the scleral wound and left incarcerated (iridencleisis) or slightly prolapsing. Holth reported a series of 41 operations and, in a later paper (Annales d'Oculist, July, 1909), a series of 87 operations. In the total number of operations he obtained 85.3 per cent of filtering cicatrices. He had no bad results. Some of the cases were satisfactory when examined two months to two years after the operations.

Borthen (Archiv f. Augenheilk., bd. xlv, 1909) reported having done fifty similar operations for the production of a subconjunctival prolapse of the iris in simple and absolute glaucoma. He claims to have obtained the desired results in every case.

Maher (Ophthal. Rev., 1909, p. 185) endeavors to produce a cystoid scar by opening the eye as for the usual iridectomy, dragging a portion of the iris from its ciliary attachment, leaving the loop thus produced prolapsed for a week and then excising it with the scissors, close to its scleral attachment at each angle of the wound. Sometimes the iris was cut at one angle of the wound at the time of the operation and left hanging at the other angle. Plastic iritis followed in one case. Maher admits the liability of infection, but does not consider it of much importance.

OPERATIONS FOR THE PURPOSE OF PRODUCING A FILTERING CICATRIX

Sclerectomy in glaucoma is performed for the purpose of obtaining a filtering cicatrix. Under this term may be grouped all the forms of operations which aim to remove a portion of the sclera by means other than by the trephine. Sclerectomy may be performed:

(*a*) Without iridectomy
(*b*) With peripheral iridectomy
(*c*) With ordinary iridectomy

Under the heading "Sclerectomy" may be considered the operations of Lagrange, Holth, Dor and Jacqueau.

The Lagrange operation (Arch. d'Ophth., August, 1906). A Græfe knife is employed in making the incision. The puncture and counter-puncture are made 1 to 1.5 mm. from

the corneal margin in the sclera and 7 mm. apart. The iris angle is thus entered and the incision is continued in the iris angle well back so as to divide the ciliary or annular ligament throughout a large part of the incision. Before the bridge of the sclera is divided, the edge of the knife is directed backward so that the sclera is cut obliquely. A large conjunctival flap (about 4 mm. wide) is made (see Fig. 7). The edge of the conjunctiva is seized with forceps, drawn downward and forward, tilting the edge of the scleral flap forward. A rather long fusiform piece of the scleral flap so tilted forward is removed by means of curved-on-the-flat scissors (scissors made by Luer of Paris, see Fig. 8). The piece removed should include the entire thickness of the sclera at the middle of the incision. If no iris is to be excised, the conjunctival flap is restored to its position and a dressing is applied. If the iris is to be excised, a small portion at the periphery may be raised by means of small iris forceps and excised, or a broad iridectomy may be made. As a rule the conjunctival flap will retain its position without the use of sutures.

The excision of a piece of sclera after this method is performed by Lagrange without iridectomy (Arch. d'Ophthal., September, 1910).

1. In cases of glaucoma with intermittent hypertension, or with very slight hypertension.
2. In those cases in which iridectomy is recognized as dangerous, as in glaucoma in which the visual field borders on the fixation point.
3. In hæmorrhagic glaucoma in which operation is deemed advisable.
4. In cases of glaucoma coincident with adhesions of the iris, such as will necessarily prevent prolapse of that membrane.

Lagrange writes, "As a rule, eyes constantly below T+1 will merit a simple sclerectomy alone."

Sclerectomy with the excision of a piece of the iris at the periphery (peripheral iridectomy) is done by Lagrange in cases in which a sclerectomy only was designed, in which the iris bulges into the wound slightly and cannot be easily restored. The iris is seized near its insertion, drawn out slightly, and a small piece excised, button-holing the iris.

Sclerectomy with iridectomy is performed by Lagrange in all cases in which the tension is high. Lagrange writes, "On the whole, iridectomy probably goes for little, perhaps nothing, in the successful result, but in the case of glaucoma with rather much hypertension, iridectomy should be performed for two reasons; first, that it is no trouble" (?); secondly, that it takes away, even better than does the button-hole of Holth, the fear of prolapse after sclerotomy in a tense eye."

Cases reported by Lagrange:

1. Simple perforating sclerectomy, 16 cases; 15 good, 1 failure.
2. Sclerectomy with peripheral iridectomy, 4 cases; 3 good, 1 failure.
3. Sclerectomy with iridectomy, 47 cases; 46 good, 1 failure.

The operation of Brooksbank Jones (Trans. Ophthal. Soc., vol. v, fasc. i, 1910) is a modification of the Lagrange operation in which he prefers to use the Vacher punch forceps (Fig. 9). Holth (Ann. d'Oculist, July, 1909) described a modification of Lagrange's operation in which he uses the punch-forceps of Vacher, which he has modified.

The following description of this operation is by Coulter (Ophthalmoscope, November, 1909):

"The operation can be performed by two methods:

"(*a*) By a linear incision upward with a Græfe knife. The pupil being contracted by pilocarpine (not eserine), a puncture and counter-puncture are made in the sclerotic 8 mm. from each other, and 1 mm. from the limbus with points of entry into and exit from the conjunctiva as far from the limbus as possible, a scleral flap 2 mm. to 2.5 mm. high and a conjunctival flap extending to 8 mm. from the limbus are cut (see Fig. 10); the conjunctiva is freed with McDowell's (or curved blunt-pointed) scissors from the anterior lip of the scleral flap and raised with a forceps. a piece of the scleral flap 3 mm. long by 1.5 mm. broad is removed by the punch forceps, and a small extra-sphincteric iridectomy is performed, unless the iris prolap-

ses, when an ordinary iridectomy is done. The conjunctiva is then carefully replaced and, as a rule, requires no suture. This procedure is suitable for cases with slightly increased tension and a high degree of direct astigmatism. It is the easiest operation, and can be performed without an assistant.

"(*b*) By a 6 mm. subconjunctival incision, usually upward, with a keratome. The pupil being contracted by pilocarpine, the conjunctiva is punctured 10 mm. from the limbus, and the keratome passed downward beneath it to a point 2.5 mm. from the limbus where the sclerotic is punctured. The bulbar conjunctiva is then freed with blunt-pointed scissors between the scleral wound and the limbus. With the help of the curved forceps, the conjunctival flap is caught on the double blunt hook and pulled down, so as to lay bare the scleral wound, the lower blade of the punch-forceps is introduced into the incision until 1.5 mm. of sclerotic is seen through the upper blade, when it is cut off rapidly. The blunt hook is then handed over to the asistant, and a peripheral iridectomy is performed, so as to avoid prolapse of the iris. Finally the conjunctival flap is replaced with the spatula. A complete iridectomy is done if the iris prolapses, if there is a central opacity of the cornea or lens, or if there is a cataract which will require extraction later. The entire subconjunctival pocket can be made with scissors right up to the limbus, and the keratome used for the scleral puncture only. This is more tedious, but probably preferable for lateral operations.

"Since June, 1908, Holth has performed his operation thirty times. He claims priority over L. Dor, who practised a similar procedure for the first time in October, 1908.

"In his first ten cases he made his scleral incision 0.5 mm. from the limbus, freed the conjunctiva, and pulled it down with the hook, then depressed the corneal edge of the incision with the lower blade of the punch-forceps, which he slipped backward, so that on closing the instrument he excised a piece of the posterior lip. The piece of sclera excised by this means was larger than that removed from the anterior lip, but not in so favorable a position. In all these cases fistulous cicatrices and normal tension were obtained, but in two instances the good results were not maintained. Holth, however, suggests that he may return to this method, as he thinks that these failures may have been owing to defects in the punch-forceps, which had not been perfected at the time he performed it.

"In the remaining twenty cases the sclerectomy was performed on the anterior lip, and always produced a fistulous cicatrix when the piece of sclerotic removed was sufficiently large (i. e., 5 mm. broad)."

Holth gives a microphotograph of a section of an eye obtained from a patient who died of pulmonary embolism following a fracture of the femur six weeks after the operation on the eye in which "in spite of the fact that the scleral flap measured only 1 mm., there was fistulisation with normal tension and marked improvement of visual acuity and field. The section shows that the scleral incision did not reach the anterior chamber, but the posterior lip of the scleral incision folded backward on the ciliary body so as to permit the fistulisation. There was no sign of reaction in the sclera, the wound was filled with loose connective tissues derived from the conjunctiva. In the outer two thirds of the wound cicatrical contraction of the scleral tissue was prevented by this transplantation of the subconjunctiva into the gap in the sclerotic, while in the middle third its absence seems to have been due to the action of the aqueous."

The advantages claimed for sclerectomy after incision with a keratome are freedom from risk of expulsive hæmorrhage or rupture of the zonule, and the slight amount of the astigmatism produced, which amounts to 0.5 D., or 1 D. only

Holth contends that the following three conditions must be obtained before an operation for the cure of a glaucoma by the production of a fistulous cicatrix can be considered to have fulfilled the purpose for which it was devised, and postpones the publication of his results until sufficient time has elapsed to allow of their being fulfilled in a series of cases:

1. There must be conjunctival œdema over and around the scleral wound, showing the presence of a subconjunctival fistula.

2. The tension must be constantly normal, or sub-normal, as shown by the tonometer.

3. For two years after the operation the visual acuity and fields (which often improve to a marked extent) must not become worse than they were before.

Bettremieux's operation. (La Clinique Ophthal., 1907 and 1908). Simple anterior sclerotomy. Bettremieux recites the following: "(1) that glaucoma has been caused experimentally by the cautery applied round the cornea, or by tying the anterior vessels, or accidentally, by burns at the corneo-scleral junction, i. e., by conditions which block the intra-ocular blood circulation; (2) that Exner explains the action of iridectomy in glaucoma on the ground that the arteries and veins in the iris are made to communicate directly with each other, and that this restored the normal circulatory conditions. Taking this as his basis, he operates as follows: The sclerotic having been exposed, with a needle slightly curved at its end he traverses tangentially to the corneal margin, the outer layers of the sclera, which he then excises with a thin and narrow Græfe knife. This produces what he calls a 'filtering zone,' but later he lays all the emphasis on the setting up of an anastomosis between the deep scleral and more superficial subconjunctival vessels, which restores the normal blood circulation of the eye." If Bettremieux's own conception of the operation be the correct one, it probably ought to be included in the group of operations aiming at the production of a filtering cicatrix.

Herbert's wedge-isolation operation. A narrow Græfe knife (⅓ mm.) is used. The eye is fixed with forceps at the inner side. The conjunctival puncture is made 1.5 mm. to 2 mm. from the projected line of the incision, the loose conjunctiva being pushed down with the point of the knife. The puncture is made as close to the margin of the cornea as possible and still be subconjunctival. The point of the knife is directed only slightly downward. As it is designed to accomplish the very small primary incision while making the puncture and counter-puncture, the edge of the knife is directed slightly backward. The course of the blade in the anterior chamber is 3 to 4 mm. The counter-puncture should correspond with the puncture. It should be made slowly. As the aqueous escapes, the conjunctiva is slightly raised. As soon as the point is well through the blade is turned so that the cutting edge is directed downward; puncture and counter-puncture are then enlarged, the enlargement being sufficient when the width of the blade can be seen through the cornea. The incision is now enlarged upward by turning the knife and cutting upward and slightly backward, leaving a thin bridge of sclera undivided. The blade is now pressed downward, slightly turned so that the edge is directed toward the corneal margin (in a line with the normal to the surface) and the secondary incision is made slowly by gentle to-and-fro movements, completing the incision through the sclera without dividing the overlying conjunctiva. The primary incision is then completed subconjunctivally. The wedge of sclera which now remains attached to the conjunctiva is ½ to ⅔ mm. in thickness (see Fig. 11). A conjunctival flap is now made to permit of the performance of an iridectomy. Herbert leaves a small bridge of conjunctiva above to prevent the displacement of the flap in the course of healing. A peripheral "buttonhole" rather than a complete iridectomy is now made. The iris should be contracted by eserine at the time of operating. In the after treatment the eye is bandaged 24 hours.

If the filtration is not free, massage may be resorted to early (after 24 to 48 hours) and continued once daily until permanent low tension is obtained.

Another procedure suggested by Herbert and now quite largely practiced by a number of ophthalmic surgeons is as follows: He selects a convenient spot, usually down and out, and pushing up the conjunctiva so as to give a valvular covering, thrusts a narrow (⅓ mm.) Græfe knife into the periphery of the anterior chamber 1 to 1.5 mm. from the corneal margin. An incision 1.5 to 2 mm. is made parallel to the margin of the cornea. The knife edge is then turned toward the corneal margin at one end of the incision and made to cut to the corneal margin (see Fig. 12). A similar secondary incision is made at

the other end and sometimes in the middle of the tongue of sclera. Thus a small flap of sclero-corneal tissue is made which receives its nourishment from the corneal side. Herbert states that "these partly isolated tongues show no tendency to rapid reunion." The tension of these eyes has remained low and the conjunctiva over the small wound has remained elevated, or could be elevated at once by forcing out a little aqueous by finger pressure on the globe." In order to avoid injuring the iris, as is apt to happen if a sharp-pointed knife is used to make the meridianal incisions, Herbert suggests using Lang's blunt-pointed synechia knife. Harman (Ophthalmoscope, February 1, 1911) describes a "twin scissors" which he has designed and employs for making the short meridianal incisions in this operation of Herbert's.

In 1872 de Wecker (Annales d' Oculist., October, 1872) applied trephining in the treatment of glaucoma in which a satisfactory iridectomy could not be made and a simple sclerotomy would not suffice. The object was to relieve the patient of pain and to obviate the necessity of enucleating the eyeball.

Operation. With a trephine constructed on the principle of Heurteloup's artificial leech a portion of the sclera 1 mm. to 1½ mm. in diameter was removed at the edge of the cornea in such a way as not to injure the lens or to approach too near to the ciliary body. A large filtering cicatrix is established.

The operation of Elliott is a duplicate of that of de Wecker, except that de Wecker did not use the trephine subconjunctivally. Elliott's directions for the preparation of the patient in acute and subacute glaucoma are as follows: Free saline purge. Four leeches around the margin of the orbit. Solution of eserine sulphate freely instilled. Opium sleeping draughts. Hot fomentations if there is much pain. As a rule the vascular congestion and pain are much relieved by morning, when the operation is performed. Chronic cases: Laxative. A weak solution of eserine sulphate instilled one to three times daily. The objects of the operation are to reach, tap, and to drain the anterior chamber subconjunctivally.

Operation. Incision through the conjunctiva roughly concentric with the corneal margin, ending on either side about 4 mm. below the highest point of the cornea and the same distance from the inner and outer margin of the limbus. Dissect flap well down to the limbal attachment until the dark underlying corneal margin can be seen through the flap at the point for applying the trephine. Care must be observed not to perforate the conjunctival flap. The conjunctival flap should not be used for steadying the globe, as it is apt to be mutilated. Before applying the trephine, the area selected should be carefully cleared of connective tissue, tags, etc. The trephine should be applied *as close to the limbus* as possible (Fig. 13). The object is to enter the anterior chamber without injury to the annular ligament or ciliary body, a simple trephining to drain the anterior chamber. The trephine should be applied squarely and the cutting should terminate as soon as the sclera is cut through. If the disc of sclera is not fully detached by the trephine, the detachment can be completed by means of the iris scissors. The trephine, which may be a Von Hippel or a hand trephine, should not be more than 1.5 mm. to 2 mm. in diameter.

Iris. If the iris presents, it may be incised meridianally. This will liberate the aqueous and the iris may return to its position spontaneously. If it does not, a portion is excised. The iris should not become impacted in the wound. The anterior chamber may be irrigated with normal saline solution if the wound is obstructed by tags of iris or clots of blood.

Closure of the wound. Sutures are not necessary as a rule. If there is a tendency to gape, sutures may be sued.

After use of drops. If the pupil is irregular, eserine sulphate 1 per cent solution may be instilled for the first two days. Major Elliott puts in a drop of a solution of atropine in the third day.

Elliott (Ophthalmoscope, July, 1910) reported 128 operations on 89 patients. Of these operations 122 were primary and 6 secondary.

Loss of vitreous, 6 cases.

Failure to enter the anterior chamber, 5 cases.

The form of glaucoma was given as:

Primary noncongestive glaucoma, 57 cases.

Primary congestive glaucoma, 40 cases.

Acute glaucoma, 25 cases.

Results. Return of tension occurs in a low percentage of the cases. (Elliott mentions two cases.) In many cases the tension remains normal; in some subnormal. The operation sufficed to relieve pain in all of the six cases of absolute glaucoma with painful eyeballs. Vision remains the same or is improved in the greater number of cases operated upon. In a small percentage of the cases the vision diminishes after the operation in spite of the fact that the tension is lowered. A cystic filtering scar is the rule, the cyst increasing in size on massage.

A modification of the operation of trephining the sclera has been introduced by Verhoeff (Ophthal., March 1, 1910), who has devised a special instrument for the operation which he terms a "sclerostome." The instrument is a combination of a punch and a trephine. The diameter of the trephine is 1.4 mm. It cuts a hole in the sclera about 1 mm. in diameter (Fig. 14).

Operation. A conjunctival flap is made much as in the operation of Elliott (see above), "then by means of a small, broad, bent needle, keratome, or Græfe knife an incision 2.5 mm. to 3 mm. long is made parallel with and at about one half millimeter from the limbus. One end of the incision should lie under the middle of the conjunctival flap. The button of the instrument is then gently introduced through the incision, the instrument being tilted at an angle to render this easy of accomplishment. After the anterior chamber is entered, the instrument is held perpendicular to the sclera and carried to one side, so that the fine rod with the button fits closely in the end of the incision corresponding to the middle of the conjunctival flap (see Fig. 15). The outer tube is now screwed down, the inner rod being held stationary, or turned slightly in the opposite direction if necessary to obviate undue twisting of the eye. If resistance is encountered, as it may be toward the end, the outer tube may be screwed backward and forward a few times instead of continuously forward. A clean, round hole is thus cut in the sclera. The diameter of the hole is only one millimeter, somewhat less than that of the cutting edge of the instrument. A small button-hole is now made in the iris, exactly beneath the hole in the sclera."

Verhoeff has operated but a few times. He writes, "The results, however, have sufficed to show that the opening remains patent and is effective in lowering the tension."

OPERATIONS ON THE NERVES CONNECTED WITH THE EYE

Stretching the supratrochlear nerve. This has been resorted to by Brailey (British Med. Jour., October 10, 1885) for the relief of pain in absolute glaucoma. He reports some favorable results: the operation has not come into general favor.

Laceration of infratrochlear nerve. Badal's operation (Arch. d'Ophthal., xxi, p. 433). A curved incision is made along the border of the orbit, extending from the upper border of the internal canthal ligament 1½ to 2 cm., cutting through the skin and orbicularis muscle. The nerve trunk pierces the septum orbitale at the margin of the orbit a very little higher than the upper border of the insertion of the inner canthal ligament. It is sought for in the cellular connective tissue, seized with the forceps, and torn out or excised. The wound is closed by sutures.

Lagrange, as a result of 81 operations, concludes that the operation is capable of relieving pain in acute glaucoma, and even of lowering tension, but its effects are undertain in chronic glaucoma. Many other surgeons report similar results.

Optico-ciliary neurectomy. This operation is performed in various ways. The method employed by Golowin appears to be well planned. (Zeit. f. Augenheilk., v, p. 414). The outer commissure is divided and the eye rotated strongly inward. Before dividing the optic nerve, ciliary muscles and vessels, they are seized with small clamp forceps 1 cm. behind the globe to prevent hæmorrhage. The optic and ciliary nerves are then cut near the forceps, care being observed to include the bunch of ciliary nerves that lie beneath the internal rectus muscle. The globe is then rotated farther outward and the section of the optic nerve and ciliary nerves separated from the globe and removed. If the forceps con-

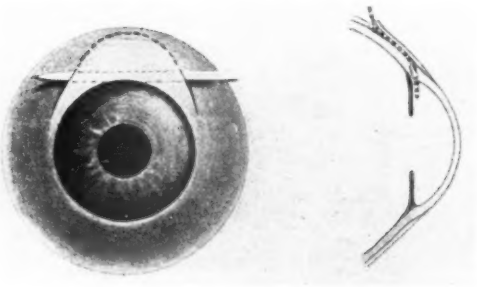

Fig. 7. The Lagrange operation—Incision

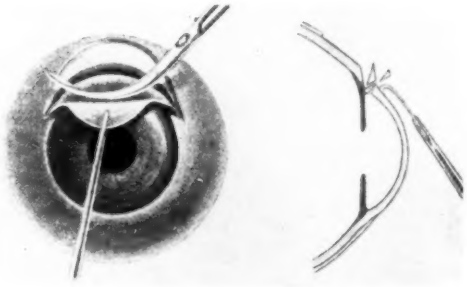

Fig. 8. The Lagrange operation—Sclerectomy.

trolling the hæmorrhage are permitted to remain in position ten minutes, hæmorrhage does not occur to any great extent. The external rectus may be united by sutures, and the conjunctival wound closed. A firm compress bandage is necessary, as some bleeding may take place.

Results. The eye may retain the appearance presented before the operation; the operation may be followed by hæmorrhage into the tissue of the orbit, producing exophthalmus; or ulceration of the cornea and atrophy of the globe due to trophic disturbances may result.

Golowin advises this operation in absolute glaucoma with pain; in absolute glaucoma without pain, when iridectomy is not possible; and in glaucoma when pain continues in spite of other operations.

Resection of the superior ganglion of the cervical sympathetic. Irritation of the cervical sympathetic, as pointed out by Hamer (Klin. Monatsb., 1873) produces dilation of the iris, protrusion of the globe, etc. Experiments on animals by Admuck, 1866 to 1868, and by Von Hippel and Gruenhager, referred to by Jonnesco, show that irritation of the cervical sympathetic (Wiener klin. Wochenschrift, May 4, 1899) produces temporary increase of intra-ocular tension.

Destructive disease of the sympathetic, as has long been observed, causes myosis, slight ptosis, and decrease in intra-ocular tension. The experiments of Lagrange and Pachon, Hertel and Logandorff (Soc. de Biologie de Paris, November 24, 1900; Græfe's Archiv., xlix, 2, p. 430; Klin. Monatsbl. f. Augenheilk., xxxviii, p. 129) prove that excision of the superior ganglion of the cervical sympathetic produces temporary reduction of the intra-ocular tension.

In September, 1899, Jonnesco resected the superior ganglion of the cervical sympathetic for the cure of glaucoma, and in May, 1900, he reported eight cases. Very marked improvement was reported in all but two cases. Abadie, who regards glaucoma as a disease due to (Arch. d'Ophthal., July, 1898) derangement of the sympathetic, resorted to section of the cervical sympathetic in 1898 for the cure of glaucoma. It has been found that the immediate effect of resection of the superior ganglion of the cervical sympathetic is myosis, followed in a few hours by reduction in tension, deepening of the anterior chamber in many cases, improvement in acuity of vision, and increase in size of the visual fields. In a large percentage of the cases, the tension returns in a few days and fluctuates for some weeks. It may then remain approximately uniform, usually above the normal. Acute glaucoma on the side operated upon follows in some days or weeks in about 10 per cent of the cases. An acute attack in the fellow eye may follow this operation. In a few cases of simple glaucoma relatively permanent results have followed sympathectomy, but in the greater number the relief is temporary. We are at present unable to tell what cases will be permanently benefited. Removal of the superior ganglion produces throbbing and a sensation of fulness in the head due to vasomotor disturbances, which are sometimes annoying and persist for a number of months.

Fig. 9. Vacher punch forceps.

Fig. 10. Holth's modification of the Lagrange operation.

Sympathectomy may be tried in hæmorrhagic glaucoma (it does not increase intraocular hæmorrhage); in simple glaucoma, in the cases where the limit of the field of vision is near the fixation point; in absolute glaucoma; and simple glaucoma after iridectomy and sclerotomy, if these do not suffice to arrest the disease.

Operation. Three routes are open to the operator — one behind, one in front of, and one through the sterno-mastoid muscle. The anterior route is the simpler and more direct. The incision need not be more than 5 cm. long; it should begin or end just anterior to the tip of the mastoid process, and extend along the anterior margin of the sterno-mastoid muscle. It is best to stop all bleeding, as far as possible, before passing the deep cervical fascia. The deep cervical fascia is now divided (grooved director may be employed). By means of a retractor the sterno-mastoid muscle is drawn outward and backward. The spinal accessory nerve may now come into view as it passes into the sterno-mastoid muscle. The belly of the digastric muscle forms the base of a triangle that is now entered, which contains loose connective and some adipose tissue. The bundle of large vessels and the pneumogastric nerve lie along the anterior border of this triangle, and by continuing the blunt dissection it is soon found. The bundle of vessels and nerves is drawn gently forward and toward the median line. In the writer's experience, the sympathetic is always raised with the sheath of the large vessels. It is well to determine the location of the pneumogastric nerve, and to this end, it is expedient to open the sheath of the vessels posteriorly. The white trunk of the pneumogastric nerve will then come into view. It should not be injured in any way. Search in the tissue of the sheath backward and a little inward will result in finding the sympathetic nerve. This should be followed upward by dull dissection until the superior ganglion is exposed. The lateral branches going to and from the ganglion should be divided, and the ganglion freed well up to the base of the skull; it may then be seized with forceps at its upper extremity and torn out, or it may be cut close to the skull. The trunk of the nerve just below the ganglion may then be cut across. The deep fascia is united by catgut sutures, the wound in the integument closed by means of a continuous suture, and the bandage applied.

Union by first intention usually follows. There is frequently slight swelling of the tissues in the vicinity of the wound, because of the trauma produced.

The value of the operations mentioned in this communication appears to the writer to be as follows:

Posterior sclerotomy and trephining back of the ciliary zone are operations that give good results in sightless painful eyes in absolute glaucoma, relieving pain and permitting of the retention of the eyeball without danger of subsequent infection or injury of the fellow eye by sympathy. The writer's experience covers five cases only. The operation was performed in absolute glaucoma for the relief of pain; the operation was successful in that the pain was relieved. The patients were under observation for various periods — from three months to two years. In two of the cases the tension became about T—1, and remained so.

Sclero-ciliotomy (Hancock, Walker) and ciliarotomy (Abadie and Querenghi) are operations which have been strongly advocated by their originators. They are operations with which the writer has had no experience. It is, however, very probable that they give temporary relief, at least, and may be of permanent value in cases of absolute glaucoma. The writer would hesitate to perform the operation of Hancock in any case because of

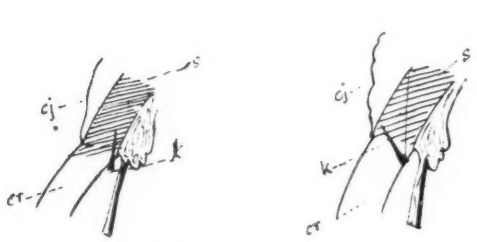

Fig. 11. Herbert's wedge-isolation operation.

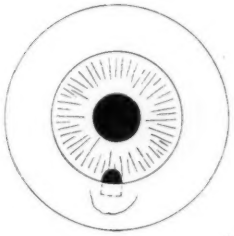

Fig. 12. Herbert's scleral "tongue" operation.

an open wound through the ciliary zone. Operators of experience are unanimously agreed that paracentesis of the anterior chamber is only of very temporary benefit.

Anterior sclerotomy (de Wecker and Querenghi) belongs to the same category as paracentesis of the anterior chamber except that the reduction in the tension of the eye is of much longer duration. If these operations alone are employed, the tension returns sooner or later, usually in from two weeks to three months. The greatest value that the operations possess is as a supplement to iridectomy.

Bjerrum's sclerotomy, since it contemplates incarceration of the iris, is a different proposition. The opening in the sclera is covered by a conjunctival flap and communication between the anterior chamber and the loose subconjunctival tissue is brought about and made permanent, when possible, by subsequent massage of the eye. Reference to Fig. 16 renders it clear that the incision must, in many cases at least, cause the anterior chamber and the peri-chorioidal lymph space to communicate by dividing part of the annular ciliary ligament. This operation raises the question of the desirability of inducing and making permanent incarceration or prolapse of the iris, even subconjunctivally.

The operations of Rochon Duregueaud and de Vincentiis, which contemplate dividing the tissues at the iris angle and making more direct communication between the anterior chamber and Schlemm's canal, must of necessity fail to bring about permanent reduction of intraocular tension in a large percentage of the cases operated upon, although the favorable reports on the results of this operation by Tailer, Sgrosso and others make it appear that a fair percentage of the cases are very materially benefited.

Cyclodialysis as practiced by Heine is apparently losing favor. The reports of operators who have practiced this procedure, other than Heine, G. Weinicke (ref. above), Elsching (Zeitschrift f. Augenheilk., xxii, p. 391) and others, indicate that it succeeds in effecting a permanent reduction of tension in approximately 50 per cent of the cases. A. Knapp writes, "It can be conservatively stated that cyclodialysis is of value in certain limited conditions; it is indicated in the advanced cases of chronic glaucoma, especially those in which iridectomy has not succeeded in reducing the tension. It cannot in any way replace the classical operation of iridectomy, or its recent modifications in incipient glaucoma." The experimental research of Joudine (Westnik Ophthal., March, 1908), Wichodzeff (Klin. Monatsbl. f. Augenheilk., December, 1907, p. 601), and others made on animals demonstrate the fact, in the animals experimented upon at least, that the communication between the chorioidal space and the anterior chamber is soon closed by a deposition of cicatrical tissue. It is possible that the results of these experiments can be compared only in a limited sense to results in the human eye.

The operation of Fergus, which differs from that of Heine only in that the opening in the sclera is made by removing a disc 2 to 3 mm. in diameter by means of a trephine, cannot as yet be passed upon, as a sufficiently large number of cases has not been reported. It is evident that its superiority over Heine's operation could result only from a more persistent filtering scar, due to the removal of the disc of sclera.

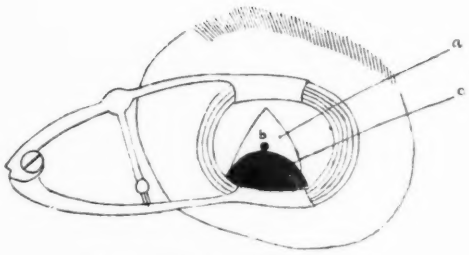

Fig. 13. Elliott's trephining operation.

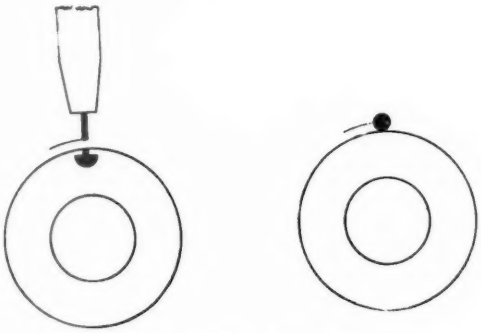

Fig. 15. Verhoeff's operation.

Operations that contemplate the incarceration or prolapse of iris, the incarceration of the conjunctiva or other tissue, or the formation of a cystoid scar without adequate covering, as by the conjunctival tissue, are open to the objection that infection may take place at a favorable time, days or years after the operation, and that sympathetic inflammation may occur. All ophthalmologists of large experience have observed these complications in such cases and have learned to look upon eyes in this condition as possessing a constant menace to vision. Operations that contemplate prolapse or incarceration with adequate conjunctival covering are objectionable because of necessary distortion of the pupil and, in some cases, deformity at the site of the wound. These eyes are not entirely free from danger of subsequent infection, but infection will be extremely rare and the benefits derived from some of the procedures, as for instance that of Holth, may justify the operator in making the operation. However, if the same result can be obtained by operation not complicated by incarceration or prolapse, the procedure is much more desirable. A protected filtering cicatrix without incarceration or prolapse of iris or other tissue, with or without iridectomy, is a desirable condition to obtain. The endeavors of Lagrange, Holth, Herbert, Elliott and Verhoeff are in the right direction. The writer's experience has been almost entirely with the Lagrange operation. He has records of seventy Lagrange operations. The cases were:

Simple chronic glaucoma	29
Subacute glaucoma	30
Acute glaucoma	5
Absolute glaucoma	2
Secondary glaucoma	4

Thirty of the eyes operated upon (27 private and 3 dispensary cases) have been under observation for periods varying from two weeks to four and one half years. The remainder were dispensary cases and were not kept track of. Vision before operation ranged from zero to $\frac{20}{20}$. In the cases of chronic glaucoma, 16 in number, all have retained vision as good or better than before operation, except four. Of these nuclear cataract is developing in two, in two the fields have narrowed slightly and vision is reduced. Of the subacute cases, 10 in number, vision has remained good, nuclear cataract is developing in two. The cases of acute glaucoma, two in number, were cured. There was one case of absolute glaucoma in which the pain was relieved. One case of secondary glaucoma; tension reduced, so far permanently. The three forms of cicatrix described by Lagrange (Ophthalmoscope, May, 1908), namely, the smooth cicatrix, the dark line at the site of

Fig. 14. Verhoeff's sclerostome.

the sclerectomy, and the cystoid cicatrix have been observed in my cases. The cystoid cicatrix predominates in the chronic cases. The writer is familiar with the research work of Thomas Henderson (Ophthalmoscope, December, 1907) which goes to show that the wound in the Lagrange operation is soon filled with new formed tissue and the filtering channels obliterated. However admirably these experiments were conducted, they do not appear to apply to all of the cases operated upon by this method.

Aside from the occasional tearing of the conjunctiva where the fixation forceps were applied and a failure to remove quite as much sclera as was desired, there were no accidents. If the fixation forceps are firmly applied near the corneal margin and just below the point of counter-puncture, tearing of the conjunctiva will occur in only a very few cases. It is a rule with the writer never to operate for glaucoma if the tension can be held at normal and loss of field and vision prevented by the use of miotics. It is the custom of the writer to begin gentle massage of the operated eye three to five days after the operation, to continue it daily while the patient is in the hospital and to have the patient use miotics as long as there is any indication of increase of tension above the normal. These measures have aided greatly in making the results as good as they have been. The writer is favorably impressed by the results of the operation

Fig. 16. Incision for iridectomy in glaucoma.

and will continue to practice it in all suitable, important cases until he is convinced that some other procedure is better. It remains to be seen whether the use of the Vacher punch-forceps or the trephine in removing a piece of sclera in the operation of Lagrange is better in any respect. All have the same object in view; namely, the creation of a permanent filtering cicatrix.

In regard to the operations on the supra and infratrochlear nerves, optico-ciliary neurectomy and the operations on the cervical sympathetic, nothing more need be added.

CODIVILLA'S METHOD OF LENGTHENING THE LOWER EXTREMITY[1]

By ALBERT H. FREIBERG, M. D., Cincinnati, Ohio

IN 1903, Codivilla, of Bologna, published his first account of a method by which to accomplish elongation of a lower extremity which is abnormally short, as the result of injury, disease or malformation. The fundamental features of this method are, that the distracting force, by which the elongation is accomplished, is applied directly to the skeleton by means of a nail or steel rod which is driven through the os calcis, and that the elongation which is thus obtained is held, pending the accomplishment of the healing process, by means of a dressing of plaster-of-Paris and steel bars, suitably arranged. Since the time of this original communication of Codivilla's there have appeared articles by a number of European surgeons, in which the same method has been applied with success, and other procedures have been brought forward, notably by Steinmann, in which the nail, or other appliance driven into the bones, has been utilized as the vehicle for securing extension by applying weight and pulley to the extremity.

Passing by, as a matter of subsidiary importance, a considerable amount of controversial discussion which has appeared concerning priority of authorship and invention in the use of the nail driven into the bone, there would, nevertheless, remain for scrutiny an element of difference in the methods of Codivilla and Steinmann, which may, perhaps, be regarded as of fundamental importance. It seems justifiable, moreover, to bring the subject to your attention, for the reason that it appears to have excited but little interest among American surgeons up to this time. At first glance the chief divergence of the two methods might appear to lie in the skeletal point chosen by each for the application of force. Codivilla, in all cases, drives the nail into the os calcis, whereas Steinmann chooses the lower end of the distal fragment of a fracture for this purpose. We might agree with Steinmann in recognizing in his method the more direct and mechanically more efficient application of force, approving of the elimination of the ligamentous apparatus of the knee in femoral fracture; or, we might look with favor on Codivilla's plan of avoiding the perforation of the lower end of the femur, with its vital menace of infection, and choosing for this purpose a more peripheral, smaller and therefore less important bone, the os calcis. After this there still remains, however, an important difference, the recognition of which may result in a selection of the one or the other corresponding to the mechanical needs of the situation.

For the treatment of the usual fractures of the femur with a degree of displacement not excessive, we have no need of either method, since the extension by means of adhesive plaster or the Hodgen splint may be looked to for thoroughly satisfactory results. There are, however, many cases of very different character with which we are, at times, confronted. Such are the recent fracture of the femur, with great longitudinal or axial displacement, resulting either from tremendous force or from the physical character of the break, or, on the other hand, the fracture which has healed solidly before the displacement has been overcome, together with those cases not belonging in the category of fracture at all; cases of coxa vara and of congenital shortness of an extremity, for example.

In the recent fracture, no matter how great the shortening, we have to overcome the resistance of powerful muscles which have contracted to their full limit, it may be; that considerable force is required to accomplish this, we all know. So do we also know, however, the remarkable effect of the constant pull of a well-applied Buck's extension. Once we get rid of the skin factor, necessarily involved in the use of the adhesive plaster, it is remarkable how great is the lengthening effect of twenty to twenty-five pounds, by means of weight and pulley.

However, in the second group of cases,

[1] Read before the Southern Surgical and Gynecological Association, at Washington, D. C., December 1911.

we are dealing with a very different condition in the soft parts; the fracture having been healed for a long time, the muscles have become structurally short, and not simply functionally so. In some cases of long standing coxa vara and congenital shortness of an extremity, the inadequate length of the muscles is so evident as to require no further comment. Nevertheless, it has been shown that by the application of great force directly to the skeleton, such structural shortness may be safely and satisfactorily overcome, especially if the procedure be carried through two or more sittings. The retention of the gain in length, under these conditions, by means of a plaster dressing carries with it the advantage of secure splinting at the site of fracture or osteotomy, and, in addition, a much greater facility in handling the patient in bed and promoting his comfort.

Our attempts at applying plaster dressings in this manner, in the past, have been unsatisfactory, chiefly because of the impossibility of preventing decubitus at the dorsum of the foot and at the heel. This is entirely avoided by Codivilla's method of transfixing the heel. At the same time we are enabled to use degrees of force, with safety, far greater than was otherwise possible.

I present a brief description of the manner in which I have applied this method, since it differs from Codivilla's, in the use of apparatus which is easily portable: Codivilla uses the Schede extension table, which is cumbersome, complicated, and, indeed, not met with in this country. After open operation at the site of the healed fracture, sufficient to thoroughly liberate the ends of the fragments, or after doing osteotomy, in case this is required, the wound is closed and dressed as usual. The patient is now placed on a wooden table to which has been attached the pelvic rest of Langemak, which is shown in the illustration. This rest is fashioned somewhat like the pommel of a saddle, thus presenting a broad, smooth surface to the perineum as a medium for resistance against the pull to be made. The pelvis rests upon bands of heavy muslin, which, passing over the bench and pillow supporting the shoulders and head of the patient, are fastened tautly

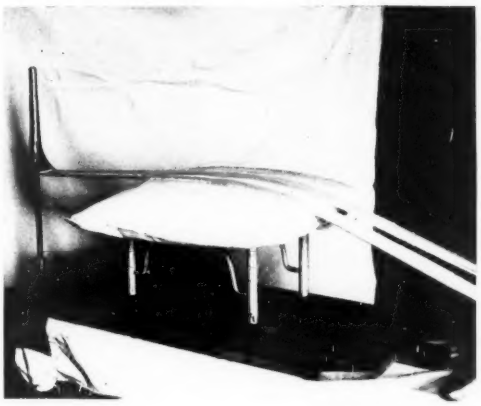

Fig. 1. Langemak's pelvic support. Of especial value when traction is to be made.

to the head of the table by means of large hooks. The lower end of the heavy rod on which the pommel rests is strapped to the legs of the table, in order to equalize the leverage and prevent canting backward of the pelvic rest. To this there is now added a traction rod, devised by Ridlon of Chicago, which is movable at the table-edge by means of a ball-and-socket joint. This, too, may be clamped to any wooden table. Traction is made by means of a powerful screw. Under careful asepsis, a sharpened steel rod is now driven through the posterior process of the os calcis. I have used for this purpose a well-tempered ice-pick, divested of its wooden handle and sterilized in the usual manner. This is connected to the traction-screw by means of heavy picture-wire and a spring scale is included, to serve as a dynamometer. By turning the screw, traction is now made on the limb, the amount of force being read on the scale of the spring balance. Traction should be steadily increased until the reading on the balance remains stationary. This may require the use of from fifty to one hundred pounds, according to circumstances.

While maintaining the traction, a strong plaster dressing is now applied from the middle of the leg to the waist; it should be well modeled about the pelvis, and especially about the root of the thigh, where the ischial tuberosity is utilized as a *point d'appui*.

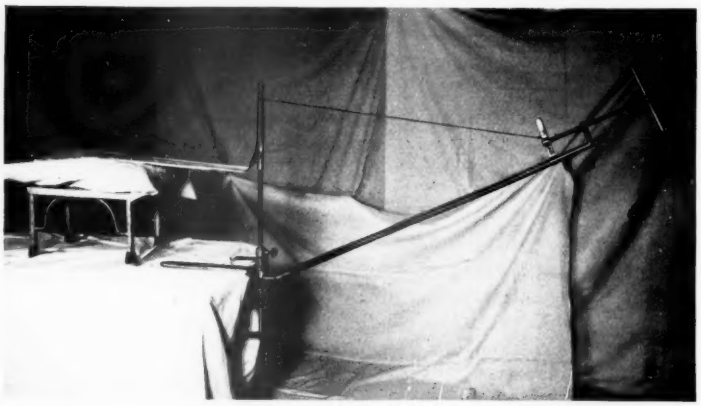

Fig. 2. Arrangement of apparatus for making powerful traction on the lower extremity.

Especial care must be taken to pad well with heavy cotton wadding and felt, paying particular attention to the anterior superior spine, of the opposite side and to the ischium. Before proceeding further, this plaster dressing is allowed to become well set and hard. There are now to be attached to the lower end of the plaster dressing two steel ferrules which have been held ready for this purpose. Mine have been 10 inches long, ¾ inch wide and made of $\frac{3}{16}$-inch steel. Within ½ inch of the lower end of each ferrule there is cut a slot, one inch long and $\frac{3}{16}$-inch wide. Transverse strips of tin are riveted into the upper ends of the ferrules, to be included in the plaster bandages by which the ferrules are attached to the plaster dressing; this is done by slipping the slot of each ferrule over the nail so that the upper end of the slot impinges upon the nail. Once this additional plaster has set the dressing is complete and the traction rod is removed.

The ferrules now maintain the pull upon the os calcis through the nail which transfixes it. In case the lengthening obtained at this first sitting is insufficient, after the lapse of a few days the plaster dressing is divided, at the level of the break in the bone, by a circular cut; a Gigli saw may be well used for the purpose. The patient is placed again in the traction apparatus, the limb is drawn upon and the additional length is secured by including pieces of cork in the gap which is made in the plaster, and further maintained by a few turns of plaster bandage. The second sitting may be done without the use of an anæsthetic, although this has not been my practice. After three weeks, the nail is sterilized on one side by means of lysol solution, and is withdrawn. The ferrules may now also be removed and the plaster dressing is allowed to remain until healing of the fracture is beyond doubt.

While my experience with this method has been very limited, I have been impressed with the painlessness of the method and the ease with which it is carried out if proper apparatus is at hand. I have had no difficulty in reducing a shortening of two and one fourth inches after fracture of the femur to a bare one half inch of shortening.

The patient was a boy of nine and the fracture had occurred five weeks before and was a spiral, of great obliquity and there was no appearance of callus. Under the anæsthetic there was no difficulty in breaking up the union, and for this reason no incision was made. While the end result was satisfactory in so far as one-half inch of shortening is of little consequence, the X-ray shows the reposition to have been imperfect and I believe that operative liberation of the fragments would have enabled us to get a result of faultless character, in this case. However, I am not sure that the price paid for a diminished operative risk was too great.

Gocht, in 1904, described his "Combined Extension Plaster Dressing," offering it as a serviceable substitute for the use of the nail through the os calcis. In this method traction is made by means of adhesive plaster with a spreader below, 25 cm. wide. The plaster-of-Paris is applied while traction is being made, the foot, leg, thigh and pelvis being well padded and included in the dressing. The adhesive strips are allowed to protrude through the plaster bandages passed about them so as to grasp them firmly. When the plaster has well set it will be found that the adhesive can not slip back. For this reason traction is maintained, and, according to Gocht, decubitus never occurs on the foot. I can substantiate the experience of Gocht, in this respect. On the other hand, it will be found much less efficient in producing tractive effect, because of its less direct application on the skin. I should use it again only in case of fresh fracture in which I desired to use plaster-of-Paris, or in case it was not possible to employ Codivilla's method for some reason. It is much more likely to prove efficient in children than in adults, because there is need of much less tractive force.

In conclusion, I beg to submit:

1. That Codivilla's method constitutes a very valuable addition to our methods of overcoming shortening in the lower extremity.

2. That it enables us to use great degrees of tractive force painlessly, and that it furnishes great ease in handling the patient.

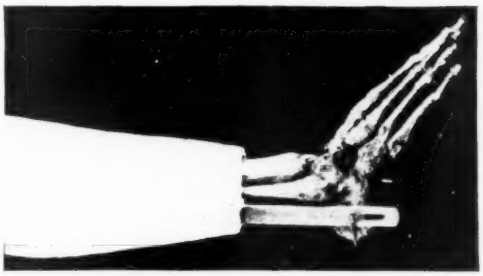

Fig. 3. (From Codivilla's article.) Showing how the rod through the os calcis is maintained in traction by means of the slotted ferrules, fixed in the plaster dressing.

3. That it has the great advantage of acting as an efficient splint at the site of the break in the bone.

4. That it is not necessary, nor even the best method in managing fresh fractures.

5. That when it is indicated, it is superior to any method in which adhesive plaster is used as a means of producing traction.

6. That, when used with care, it is free from danger to the patient.

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DEPARTMENT OF TECHNIQUE

AN OPERATION FOR RETRODISPLACEMENT OF THE UTERUS[1]

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Surgeon to the Johnston-Willis Sanatorium and Memorial Hospital

THE operation which I present to you was suggested to Dr. George Ben Johnston by myself in February, 1909, and since that time we have performed it on more than sixty women. This number of cases seems small among the three thousand surgical cases seen in this period, and is, indeed, much smaller than it would have been with the same number of individuals operated upon five years ago.

Our technique is as follows: Each round ligament is grasped 1½ to 2 inches from its uterine attachment (Fig. 1). They are then advanced to a point in the midline of the anterior surface and ½ inch from the apex of the uterus. A linen thread, on a small round curved needle, is passed through half of one round ligament, then through a good bite of the uterus, then through half of the other ligament (Fig. 2). This suture is tied firmly, bringing the round ligaments together. The same suture is continued downward, using broad ligament instead of round, for three or four stitches. At this point the uterus is left and the broad ligament is plicated to within ½ or ¾ inch of the bladder (Fig. 3). The suture is then drawn tight and tied. As a further reinforcement, an interrupted suture is placed so as to secure the round ligament to the uterus at a point half way between its original insertion and its advancement (Fig. 4).

We believe this operation to be designed along anatomical lines, in that the broad ligament, which Dr. Coffey has so ably shown to be the principal support, is utilized to the fullest extent; the round ligament is advanced in its normal direction; the sutures are placed at the point of least vascularity of the uterus, thus avoiding troublesome bleeding, and the dangers of intestinal obstruction are obviated by the absence of abnormalities which may result in the entanglement of a loop of bowel.

As to the ultimate success of this operation, our reports are necessarily limited, owing to the time over which these cases extend. I may say, how-

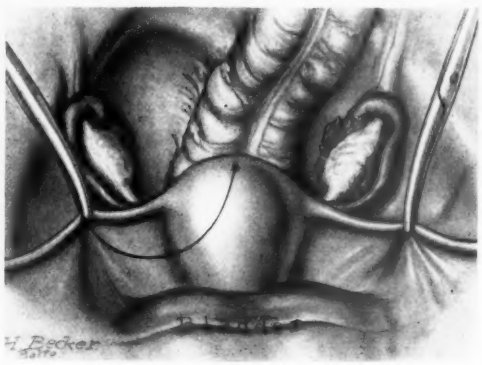


Fig. 1.

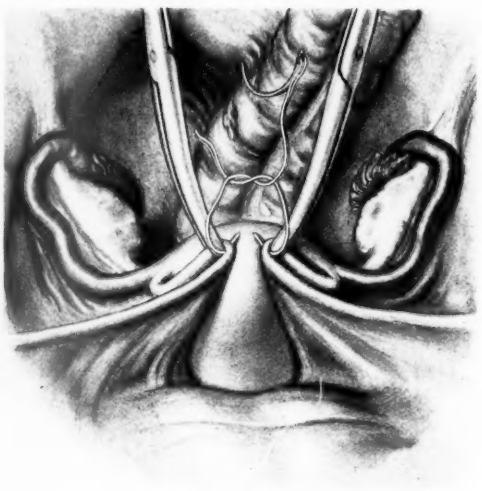


Fig. 2.

[1] Read before the 14th Annual Meeting of the Tri-State Medical Association of the Carolinas and Virginia, at Columbia, S. C., Feb. 21-22, 1912.

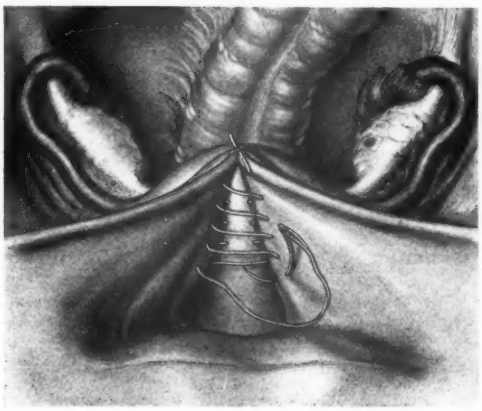


Fig. 3.

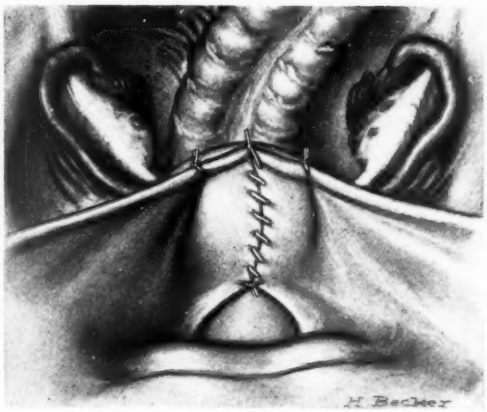


Fig. 4.

ever, that we have not observed the same pain and drawing sensations that have followed some of the older operations. In one case, explored two years after operation, the uterus was found to be in good position with the round ligament firmly attached. Most of our cases have occurred among unmarried and sterile women, so only two cases of pregnancy have come to our knowledge. These were normal in every respect. We had one recurrence where catgut was used.

The operation herein described is not a new one, as it has been performed over a period of three years in our private work and in clinics before the students of the Medical College of Virginia, and many visiting surgeons.

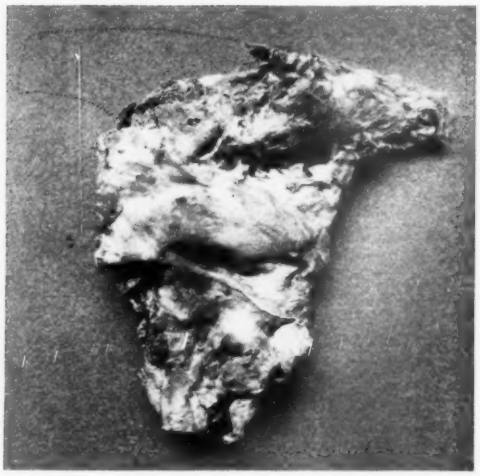
One of our surgical colleagues, Dr. G. Paul LaRoque, in writing of the operation speaks as follows: "I was so firmly convinced of the superiority of the operation above all others, I determined at once to employ it. I have had the opportunity of using it in only three cases, and in these cases the results were ideal. Indeed, I believe it is the ideal operation for the great majority of cases in which the uterus needs to be suspended and held forward. Based as it is on sound principles, anatomic, physiologic and pathologic, and being so easy of execution, the results at once and later being so satisfactory, I shall perform it in every case in which it is indicated."

REMOVAL OF STERNUM FOR CANCER WITH SUTURING OF THE INNOMINATE VEIN

By EMORY LANPHEAR, M. D., Ph. D., LL. D., St. Louis, Missouri
Professor of Clinical Surgery in the American Medical College

MOST surgeons think that when they have removed the pectoral muscles and axillary contents in the operative treatment of carcinoma of the breast they have reached the limit of surgical safety. Some years ago I presented to the Tri-State Medical Society a report of a case of excision of a large part of the chest-wall (ribs and parietal pleura) for recurrent cancer of the breast, with recovery. This paper was published in the Medical Fortnightly, and attracted considerable attention. It marked a distinct advance in the surgery of the chest, and has led to the adoption of the rule, advised at that time, of making a preliminary collapse of the lung on the side to be operated upon, and then completing the operative work some days later.

I herewith present the report of a somewhat similar step in the radical operation for recurrent carcinoma involving the chest-wall, viz.: removal of the entire manubrium, together with a large



Photograph of bone removed (one-half size). Dotted line represents portion of clavicle removed, but lost.

Photograph of cancer of sternum removed. Two-thirds size, shrunken by formalin solution.

part of each clavicle. A few surgeons have removed parts of the sternum for primary sarcoma, tuberculosis, etc., but to deliberately set to work to remove a large part of the sternum in its entire thickness, for carcinoma, has possibly never before been tried. Indeed it has been regarded as an impossibility. A surgeon of wide repute, who has taught anatomy for many years, remarked to me, when told of the following case, that removal of the manubrium is a surgical impossibility, and refused to believe the story until I exhibited patient as well as specimen.

Case Report. Mrs. Kate H. of Edgewood, a suburb of Pittsburgh, Pennsylvania, came to my clinic at the American Hospital, September 30, 1911, with the following history: She is 61 years of age, of good family history and of perfect health for many years. She was married at 30, but never became pregnant. About two years ago a cancer of the right breast developed, growing with unusual rapidity. The tumor was excised by Dr. John J. Buchanan, Professor of Surgery in the University of Western Pennsylvania, December 7, 1910; axillary contents were removed; a supplementary incision was made for removal of infected glands in Mohrenheim's space. The wound healed promptly and everything went well until about May 1, 1911, when a small nodule was noted in the suprasternal notch. This grew with extraordinary rapidity, and was removed (so I am informed) in the clinic of Western Reserve University at Cleveland on July 2d. Recurrence was immediate, with implication of the sternum and the sternoclavicular junction, and the mass had attained such size and such bony involvement by September 1st that measures for further relief were refused by several surgeons of Pittsburgh and Cleveland. She came to me through Dr. W. F. Kier.

Examination at time of admission to the American Hospital showed a malignant tumor extending from well above the thyroid to a point near the junction of the manubrium with the gladiolus, more of the mass lying to the right than to the left of midline, with extensive involvement of bone (evidenced by complete fixation of the base) and much of the sterno-cleido mastoid muscles.

Careful examination convinced me that the chief problem involved was not bone-cancer, but whether or not the great vessels beneath the sterno-cleido muscles and the clavicle were diseased. As this could be determined only by exploration I advised removal of the mass, section of the sterno-cleido mastoids for exposure of the carotid sheaths, and such other steps as might after that be deemed advisable. As she had already had a nearly fatal hæmorrhage, she readily acceded, saying she knew she had but a few days to live, sapremia being imminent.

On October 3d I cut away the cancer-mass, ligating the thyroid arteries upon each side; also the external jugulars; also the internal jugular of the right side, during the work which followed. The two sterno-cleido mastoids were cut at about their middle, and the lower halves carefully dissected out, together with all carcinoma-affected soft tissues, exposing the thyroid gland, the great vessels of the neck and part of the trachea; no attempt being made to remove the affected bone. Examination showing that the cancer did not extend behind the manubrium and that the right side was more seriously invaded than the left, the right pleura was opened and the lung permitted to collapse gradually as the patient came out of surgical anæsthesia. The clavicles were cut about two inches on either side of the sternum and patient hastily returned to bed on account of profound shock.

By October 7th she had rallied so that the operation could be completed. By exercise of extreme care the

manubrium and pieces of clavicles already severed were removed without collapsing the left lung, although at one time an alarming hissing sound admonished us to be careful, this tiny opening into the pleura being covered by seizing fascia in a large hemostat-forceps and carefully surrounding and covering the opening with a purse-string suture of No. 4 catgut, supplemented by hand-pressure with moist gauze until the completion of operation by suturing skin over and around the leak, with firm pressure by bandage and adhesive straps over all.

There was some cancer in the connective tissue over the innominate vein at its junction with the left subclavian, sufficiently near the orifice of the thoracic duct that on removal there was an astonishing discharge of chyle through an opening made in the vein-wall — rather more chyle than blood! This opening in the vein was sewed with mattress sutures of No. 1 20-day chromic catgut, reinforced by fascia brought over it from the chest-wall, sewed over-and-over with No. 2 gut. By this means all leakage was checked and the wound hastily closed.

At the first dressing on the third day there was a little gush of chyle and blood from a minute point on the cut vein, but two days' pressure by gauze-pad arrested it. Otherwise the patient made a steady, satisfactory convalescence. There was great difficulty in keeping the head from dropping backward, but as soon as the cut ends of the sterno-cleidos became well secured by forming cicatrix the patient could, by use of these as well as of the scaleni, overcome the trouble and it now looks as if she will have fairly good head-movement. The wound granulated rather slowly, and under old lines of treatment would have been closed by Thiersch graft. But the application of scarlet-red ointment so stimulated epidermization that it was unnecessary. At the time of her discharge from hospital (Nov. 27, 1911) there was only a small area of granulation-tissue uncovered.

Examination of the specimens shows that there is no involvement of the mediastinum — a most important point in a case of this kind.

The nearest approach to this case, in this country, is the following:

Keen reported a resection of the manubrium, inner third of left clavicle and lower third of the left sterno-cleido mastoid, for sarcoma, in the Medical and Surgical Reporter, March 27, 1897. His case was comparatively simple, as he removed only the inner third of the left clavicle, the manubrium and one inch of the first rib, none of the vessels at the base of the neck being laid bare excepting the left jugular, though the pulsation of the arch of the aorta was perfectly perceptible. This was performed Nov. 20, 1895. Recovery followed.

Keen also records a second case in same issue of the Reporter, of removal of the manubrium for cancer, recurrent after excision of the breast for carcinoma. In this case, however, there was removal of only a portion of the manubrium and gladiolus; operation performed March 22, 1894. The area of bone excised was only about 1 by 1½ inches, by means of rongeur forceps. The patient died of early recurrence.

At the time Keen made this report, resection of the sternum (even slight excision for any cause) was extremely rare; only seventeen cases had then been reported for tumor. He says that Heyfelder (Centralblatt für Chirurgie, May 25, 1889) had been able to collect no more than 25 cases from the time of Galen down, and six of these were superficial resections. Mynter, in 1891 (Annals of Surgery, xiii, p. 966), could find only two cases of resection of the sternum for tumors, besides his own, then recorded. Up to the time of Keen's report, then, there had been only 19 operations for tumor of the sternum, including his two cases, i. e., cases in which the entire thickness of the bone was removed.

Since then parts of the sternum have often been removed, especially by the bone-curette for tuberculosis; but deliberate excision of the manubrium for tumor (particularly carcinoma) has been extremely rare. And never before, so far as I can learn, has the innominate vein been opened and sutured.

Most operations for tumors of the manubrium have been for sarcoma, though there have been a few for chondroma, gumma, fibroma and a very few for secondary carcinoma.

It is the opinion of most operators that adhesions to the retrosternal tissues do not occur until very late; nor need there be fear of involvement of the mediastinal lymphatics unless the malignant disease has progressed very far. The tissues are merely pushed away (even including the pleura and pericardium) so that separation is easy. With the new Elsberg apparatus for tracheal insufflation there need be no longer any fear of fatal collapse of the lung. With these two things favoring the operator there now should not be any hesitancy in attacking malignant growths of the sternal region even when, as in the case herein reported, the appearance is appalling. (See photograph of tumor.)

It will be noted from the following bibliography[1] that, while Keen in 1897 was able to trace only 17 cases up to the time of his report, there had really been recorded in modern literature 32 cases.

Careful search of literature of the subject reveals the following, during the past century:

GANGOLPHE AND TIXIER. Enorme enchondrome de la fourchette sternale, resection de la moitie superieure du sternum dutiers interne des deux clavicules et d'une portion des deux premieries cotes guerison. Lyon Chirurg, 1809–10, ii, 112–117.

GHIDELLA. Ligatura dello sterno. Giornal di Chirurgi prat., Trento, 1826, ii, 267–273.

[1] For completion and verification of the bibliography of the subject I wish to return thanks to Dr. B. Merrill Ricketts of Cincinnati, author of that monumental work on "Surgery of the Chest."

O. Linoli. Della resezione del appendice xifoide; istoria de osservazione anatomico, patilogico, cliniche. Annal Universel di Medicina, Milano, 1852, cxl, 225.
V. Brune. Chronische Arthritis, Caries des Brustbeins, partiell Resection (resp. trepanatio sterni). Deutsche Klinik, Berlin, 1858, x, 74.
J. F. Heyfelder. Resectio sterni superficialis. Deutsche Klinik, Berlin, 1860, xii, 290.
Szymanowski. Klinische Erfahrungen über die partiell Brustbein-resection. Deutsche Klinik, Berlin, 1863, xv, 306–308.
Wilde. Ein Fall von Caries in tarso et metatarso sowie Necrosis corpus sternik Amputation nach Pirogoff und Resection des corpus sterni. Archiv für klinische Chirurgie, Berlin, 1870, ii, 327–330.
E. Kuster. Caries der Hinterflache des Brustbeins, Resection des corpus sterni und des processus xiphoideus ungeheilt. In his Ein Chirurg. Trienn., 1876–78, Kassel und Berlin, 1882, 125.
F. Rizzoli. Resezione e l'asportazione dello sterno fino alla cartilagine ensiforme in uno, con alcune cartilagini costali per carie necrotica reproduzione dell esso e cartilagini excise stabile guarigione. Bulletin di Scientia de Medicina di Bologna, Bologna, 1876, xxi, 161–163.
P. Lupo. Resezione parziale del manubrio dello sterno de l'estremo sternale della clavicola e della cartilagine della prima costola. Movimento, Napoli, 1878, x, 226.
Gallardo. Reseccion casi total de esternon, autopsia. Cron. medic. quir. de la Habana. Habana, 1878, 4–12.
F. Parona. Contribuzione alla resezione esportazione dello sterno. Independente di Torino. Torino, 1881, xxxii, 433–438.
F. Koenig. Resektion des Brustbeins wegen eines osteoidchondrom Heilung. Centralblatt für Chirurgie, Leipzig, 1882, ix, 681–685.
O. Ohlendorf. Ein fall von resectio sterni (Wurzburg). Hildesheim, 1884.
Bardenheuer. Die Resection des manubrium sterni. Deutsche medicinische Wochenschrift, Berlin, 1885, xi. 688 (690.
Le Fort. Resection du corps du sternum pour carie. Bulletin et mem. Societe de chirurgie, Paris, 1885, n. s., xi, 424–429.
B. Bardenheuer. Osteoplastiche Resection des manubrium sterni. Kölln Bürgerhosp. Kölln und Leipzig, 1886 0, hft. 1–79, 10 pl.
D. Molliere. Abces essi fluent du sein resection du sternum. Gazette de hospital, Paris, 1886, lix, 488.
E. Janeel. Die Resection des sternum mit Bericht über ein Sarcoma retrosternale. Neumarkt, 1887.
O. A. Rustizky. Retrosternal abscess, resection of upper half of sternum. Chirurg. Vestrik, St. Petersburg, 1887, iii, 465–467. 1 pl.
E. Rinonapoli. Resezione dell appendice xifoide. Recordi di Accad. med-chirurg. di Napoli. Napoli, 1888, xiii, 92–98 (Rap. pel Frusci) 89–91.
H. Coburg. Zwei Faelle von Resection des Sternum. Greifswald, 1888.
J. L. A. Rouilles. De la resection du Sternum. Paris, 1888.
C. E. Hewitt. Paracentesis thoracis and removal of a portion of the sternum for caries. International Journal of Surgery, New York, 1889, ii, 258.
E. Dudon. Euchondrome et resection du sternum. Journal de medicine de Bourdeaux. Bourdeaux, 1889–1890, xix, 491–503.
H. Mynter. A case of partial excision of the sternum on account of melano-sarcoma. Transactions Medical Society of New York. Philadelphia, 1891, 322–325.
A. Yvert. Indications et valeur de la resection dans l'osteoarthrite fongeuse de l'articulation des deux premieres pieces du sternum compliquee de luxation pathologique en avant du corps sur le manche. Revue de chirurgie, Paris, 1893, xiii, 32–46.
G. Dollinger. Two cases of resection of the Sternum. Budapesthi k. orvosegy, 1892, iki evkonyve 1893, 169–176.
S. C. Graves. Excision of the Gladiolus for Sarcoma Sterni. Medical News, Philadelphia, lxii, 241.
L. Desguin. Osteite tuberculeuse du sternum, resection total du manubrium. Annal de Societe Médicale d'Anvers. Anvers, 1894, lvi, 201.
X. Delore. Resection du corps du sternum pour osteite tuberculeuse, resection du coude pour osteoarthrite tuberculeuse. Provinci Méd., Lyon, 1896, x, 577–579.
W. W. Keen. Resection of the Sternum for tumors, with report of two cases and a table of 17 previously reported cases. Proceedings Philadelphia County Medical Society, Philadelphia, 1897, xviii, 49–58.
Vautrin. Ablation de la moitie superieure du sternum. Societe de Médicine de Nancy. C. v. Mem. 1898–89, 29.
P. R. Griffiths. A case of resection of the sternum for a sarcomatous growth. London Lancet, London, 1902, ii, 991.
H. Morestin. Sarcome du sternum consecuti fa un sarcome du sein resection du manubrium. Bulletin et mem. Societe Anatom., Paris, 1902, lxxvii, 414–418.
G. Larlavecchio. Metodo per le resezioni osteoplastiche e definitive parziale et totale dello sterno calla relazione di due interveni, Roma, 1903.
L. Sencert. Carie sternale abcse froid du mediastinum, resection large du sternum et extirpation de la peche mediastine guerison. Societe de medicine de Nancy, C-r, 1904–5, 100–103.
V. P. Diedoff. K. Kazuistikie rezktsiy sterni. Vrach Gaz., St. Petersburg, 1907, xiv, 124–154.
A. E. Isaacs. Excision of the sternum for sarcoma. American Journal of Surgery, New York, 1909, xxiii, 291.

It is quite possible that there are many unreported cases, for it did not strike me, until I began searching the literature of the subject (in the library of the College of Physicians in Philadelphia and that of the Surgeon-General at Washington), that the operation was extraordinarily unique or unusual. I hope, therefore, that this record may call forth reports from other American operators.

PROSTATECTOMY TO-DAY

By WELLER VAN HOOK, A. B., M. D., Chicago

IT is one thing to read the smooth histories of hundreds of prostatectomies done by the wide and stretched incisions of many noted operators; another thing quietly to ask the internes in any modern hospital how the prostatectomy cases get on after their operations and to learn of the very high death-rate and great suffering so prevalent among them.

I believe this is due not only to operating by men who have no right to do so, but to the fact that the conception of these wide-incision operations is erroneously founded on the theory that before anything surgical can be done, vision of the most convincing and brutal character must be brought to bear, that the field of operation must be exposed to the uttermost.

How would the obstetric art ever have reached its present wide-spread usefulness had not its manipulations been proved valid though so often controlled by touch alone and not by sight? By-and-by the procedure proposed and now used by the writer, many of his friends, and his assistants will be taken up and the profession and they will rejoice to find that they can accomplish their work quickly, with but little suffering and small risk to the patient's life.

The notion that this operation has anything in common with that of Dr. Goodwillie of San Francisco is primarily erroneous, since Dr. Goodwillie removed the prostatic tissue by making wounds in the prostatic urethra itself and extracting through them the pieces of the gland which he separated with the finger.

As we shall presently see, the method I use demands opening the capsule of the gland posteriorly and laterally and not through the urethra at all.

Since the original conception of the operation its principles have not been changed and the technique has scarcely been modified. The principles are as follows: The problem is that of removing the obstruction at the neck of the bladder and not the removal of a definite anatomical structure. The operation, then, is not in any sense typical or rigid but is to be regarded as the removal of that part of the hypertrophied gland which is obstructive in character. It will easily be seen what a difference in the conception of the technique this will make, since the operator will not have his heart set upon the removal of the prostate gland but will have in mind providing a free outlet for the discharge of urine. Think what a difference it would make if one were extirpating a carcinoma of the prostate. There the idea of the function of the bladder would be as nothing in comparison with removal of diseased tissue, which if left would inevitably prove fatal. If the operator has only in mind the provision of a broad channel for the discharge of urine and bears in mind that the obstruction does not lie in front of the urethra but at the sides and back of it, he has at heart during the operation a purpose involving much less of destruction than would be the case if he felt *that the prostate gland* had to be removed. Hence the first thing for the operator to do, in making use of the writer's technique, is to disabuse his mind of the thought that the prostate gland, as such, is to be the object of attack and to substitute for that notion the idea that such a part of the enlarged gland is to be removed as may interfere with the function of discharging urine.

The second principle to be borne in mind is this, that the various tissues involved in this work can easily be recognized by the sense of touch. Every operator who has had occasion to open the urethra will remember always the feeling which he had upon pushing the finger along the smooth surface of this tube. He will recall the fact that mucus is usually present and that the lining of the tube has an exquisite smoothness of surface. The palpation of the prostate from within the bladder is easy and its size and many of its characteristics can easily be studied in a few seconds in this way. Hence when the operator palpates from without, having passed the finger up along the areolar tissue to the capsule of the gland, he will have no trouble in recognizing the organ from that side.

The third principle to be borne in mind is that the hypertrophic part of the prostate can in the majority of instances be removed by a process of enucleation and, where this cannot be effected, the instrument of Guyon can be made use of to excise the masses which are in the way. It is not more than once in twenty cases that this instrument has to be used.

The fourth and final principle in the work by this technique lies in the fact that, though hæmorrhage from torn veins is profuse, it can be stopped at any moment by pressure (gauze packing) and that the operation is so quickly done that all

hæmorrhage can be brought to an end long before the patient shows any sign of exhaustion from the loss of blood.

So many inquiries have been made in regard to the technique of this work that it is well worth while to repeat the details:

The lithotomy position is used and the grooved staff introduced into the bladder.

The short incision, one inch to one and a half inches long, made transversely and three-quarters of an inch in front of the anus, divides the centrum tendineum of the perineum. This principle is that of Zuckerkandl, who many years ago pointed out how the tissues of the pelvic outlet fall apart and normally open up toward the prostate and base of the bladder, when this key to the mechanism of the outlet is touched.

When the wound made in this way heals by scar formation and contraction, the centrum tendineum is drawn together and the function of the musculature and fascial parts is entirely restored. This first incision involves no blood-vessels of any magnitude whatever and is made in a few seconds by one or two cuts with a small knife.

The centrum tendineum having been divided, the finger can be passed back of the urethra into the loose areolar tissue that surrounds the membranous part of the tube. There need be no hesitation or doubt about this manipulation, since the urethra can be felt distended by the sound.

It is now a simple matter to make a longitudinal slit in the urethra along the grooved sound, the knife being guided by the finger. A grooved director is next passed along the urethra through the groove in the staff until the discharge of urine shows that the bladder has been entered. Then the sound can be withdrawn and the left index finger can be passed into the bladder along the grooved director. It is of prime importance to examine the bladder with the finger. An assistant at the patient's left side introduces the fist into the pelvis from above and in this way pushes down the bladder and prostate gland. Any excess of urine in the bladder is allowed to escape along the grooved director. The operator can easily feel all parts of the interior of the bladder, can ascertain the smoothness or roughness of its surface, can determine whether or not it is trabeculated, and especially can make out whether or not there are stones present. The size and shape of the prostate are determined in an instant and the operator decides where he must extract the largest amounts of hypertrophied material in order that the base and neck of the bladder may be restored to such mechanical relations as will make it possible for the organ to empty itself easily and completely.

The next manipulation consists in the opening of the prostatic capsule, which is usually effected by simple pressure of the finger. But if this does not suffice, a knife can be carried along the finger and a little opening made, sufficient to introduce the finger-tip. Then a mass is extracted from the prostate corresponding with the mechanical requirements. Sometimes this mass is removable with a single manipulation but in the main the operator digs away patiently with the finger-tip until a mass of tissue has been loosened. This mass is then seized with the double tenaculum forceps under guidance of the finger. This process is repeated often enough to reduce the size of the prostate sufficiently to give a good outlet to the bladder. The operator can re-estimate the situation at any time by introducing the finger into the bladder.

The same manipulation is carried out on the opposite side.

If a so-called median lobe is present it may be removed by dissecting out the prostatic mass from beneath the mucous membrane.

One of the great beauties of this technique lies in the fact that when the masses of the prostate have been removed the operation is over. Since the tissues have been opened along normal lines of cleavage, all will fall together again and will heal in their proper relations to one another under the natural pressures of the parts. No sutures are required except the one to hold the tube in the bladder. On each side of the neck of the bladder a large piece of gauze is introduced and packed tightly into position to prevent hæmorrhage from lacerated veins. A one-half inch tube is introduced into the bladder and strongly sutured with silkworm gut to the skin at the edge of the wound and three knots are used to fasten it.

Plenty of time will be given to each of the manipulations in doing this operation, and yet not more than from four to twenty minutes will be consumed in the entire work, since the manipulations are reduced to the lowest possible requirements. There is no extensive wound to be closed, there are no blood-vessels to be tied and there are no deep stitches to cause trouble or subsequently to slough out. Hæmorrhage is minimized by keeping the finger pressed in the wound as much as possible, during the operation.

The after-treatment of these cases is simple in the extreme. All of the skin within a foot or more of the wound must be heavily coated with a stiff ointment of zinc oxide. The tube may be made

to discharge into a bottle but no drainage tube is to be fastened into it, lest the pressure of urine gathering in the bladder cause damage to it or to the kidneys. In the case of old men whose kidneys are damaged such a back pressure might lead to uræmia. Morphine may be used to control pain, though not as a rule needed. It is better to use it than to permit suffering. Pain can be caused by the tube being introduced too far into the bladder, pressing upon the upper wall of the organ. The remedy for such a pain is to shorten the tube.

As a rule, the patient sits up in bed or in a large arm-chair the day after the operation. A rubber ring seat-cushion, not too tightly inflated, must be used. Some ingenuity is required on the part of the nurse to get the patient into the chair in such a way that pain is not produced, but with a little patience it can be managed.

The tube must be left in the bladder long enough to give that organ a full opportunity to free itself of violent inflammation. The time spent in this way is not lost. On the contrary, it is time well spent in relieving the patient of the disease which is threatening his life. At the end of a week or two weeks the tube is withdrawn.

A most important point is the passage of large sounds, which is begun at the end of about two weeks after the operation. The first passing of the sound may be done under gas or cocaine. It is important that at the operation the external meatus be made large enough to admit such sounds as are required.

Sounds may be passed at intervals of two weeks, as long as there is any indication of obstruction. No operation can be performed involving the tissues about the prostatic urethra that does not make it possible to have scar-contractions that are more or less undesirable. Hence the passage of the sounds is a necessity.

As a rule, no trouble is experienced in closing the fistulous drainage opening excepting that sometimes delay occurs. The use of a silver probe armed with silver nitrate fused upon it is helpful in the closure of the tract.

Since this operation is so quickly performed the age of the patient is no bar to its application. It is the condition of the patient which is the sole criterion. And, since the complications and sufferings of the patient are as a rule traceable to the obstruction, the operation is as a rule indicated. The writer has rarely declined to operate.

THE CYSTOSCOPE IN GYNECOLOGY AND OBSTETRICS[1]

By G. BROWN MILLER, M. D., Washington, D. C.

THE relation between diseases, of the female sexual and urinary organs is so intimate that to-day it is almost essential that one who does gynecology and obstetrics should have a working knowledge of cystoscopy; and that he who does genito-urinary surgery in women should be a fair diagnostician in gynecological diseases. Some diseases are apt to develop simultaneously in the sexual and urinary female organs, such as gonorrhœa and tuberculosis; others have their origin in one, and afterward extend to the other; while in a fair number of cases the symptoms which arise on the part of the bladder are due to gynecological ailments, and *vice versa*. The close anatomical and functional association of the urinary with the genital organs in woman frequently conveys to the gynecologist patients who are suffering from disease of the bladder, and, unless he is familiar with cystoscopy, he will do one of two things: treat them symptomatically, or else refer them to a cystoscopist for diagnosis, neither of which is, at times, quite satisfactory.

According to Knorr, 663 out of 3,213 patients who came to his gynecological dispensary, or 20.6 per cent, complained of vesical symptoms. Of these 509 were actually suffering from disease of the bladder, while 154 had vesical symptoms due to gynecological disease (Winter.) These figures illustrate forcibly the necessity for the gynecologist and obstetrician to familiarize himself with the use of the cystoscope, for he who does not will occasionally fall into grave error by this want of knowledge. Likewise the genito-urinary surgeon who has not a competent knowledge of gynecological diagnosis, and who has to depend entirely upon his cystoscopic findings, is greatly handicaped in diagnosing and treating certain obscure affections in women who are suffering with urinary symptoms. The importance of the combination of cystoscopy with gynecology is so great that most modern

[1] Read before the Washington Surgical Society, December 15, 1911. See discussion, p. 643.

text-books upon gynecology include in their contents chapters upon cystoscopy, and Stoeckel has written a book of more than three hundred pages upon gynecological cystoscopy and urethorscopy.

The systematic use of the cystoscope and urethroscope has given a rational explanation for various bladder symptoms whose cause could formerly only be surmised, has broadened our knowledge in regard to the causes and treatment of urethritis, cystitis, pyelitis, tumors of the urethra, bladder, ureters or kidneys, and has given us scientific and rational indications for treatment in many cases where formerly we used haphazard and unscientific methods. Time prevents anything like a full discussion of the subject, and therefore, I can only touch upon certain conditions which have either come under my own observation, or else are of such importance as to warrant special attention. The examination of the urethra is, at times, of considerable value in making a diagnosis or in indicating treatment. To illustrate by a case: Last summer I had referred to me a patient who, I was told, had a cystocele. The history of the case did not point to this condition and the vaginal examination showed quite conclusively that the patient had a sub-urethral abscess or cyst as large as a large hen's egg. The urine contained pus and by pressing upon the tumor a whitish secretion could be squeezed from the urethra. The diagnosis was now quite clear, but there were a few points to be cleared up. Cystoscopic examination with a Kelly cystoscope showed the bladder to be normal and the urethra somewhat reddened. Upon slowly withdrawing the cystoscope and at the same time pressing upon the tumor, when a certain point was passed, there escaped through a small opening about midway between the bladder and the meatus a white, thick secretion made up of pus and granular debris. The cystoscope made two things very plain, i. e., the nature of the mass and that there was a small opening between the abscess or cyst and the urethra. The operation which cured her consisted in dissecting out the sac, sewing up the opening in the urethra, and closing the vaginal mucosa over the urthra with a small wick drain. I may remark that she had been previously operated upon by incising the abscess but it recurred as soon as the drainage ceased. This case is typical of several which I have seen.

Another use of the urethroscope is in the class of cases described by me in an article in SURGERY, GYNECOLOGY AND OBSTETRICS — i. e., incontinence of urine in women following labor. In several of my cases when this condition existed, it was evident upon cystoscopic examination with the Kelly instrument just where the fault in the closing apparatus of the bladder lay. Upon placing the patient in the knee-chest position and withdrawing slowly the cystoscope, it was seen that the urethra failed to close behind the receding tube, as it does in normal cases, but that the posterior urethra and neck of the bladder formed a conical dilatation. It was thus evident that the incontinence was due to a dilated posterior urethra, and thus we could rationally direct our efforts to relieve this condition. As this condition is usually dependent upon labor and is frequently accompanied by misplacements of the uterus backward and downward, we see the relation between bladder conditions and affections of the female genitalia. The successful treatment of these cases likewise depends upon one's familiarity with the normal relations of bladder, urethra, uterus, etc., for it is as necessary to correct abnormal condition of the perineal support as it is to tighten the sphincter urethral muscle or lengthen the urethra.

Take again the opposite condition, i. e., difficulty in voiding or inability to void the urine. This condition may, of course, depend upon some actual obstruction in the urethra, such as a stricture, calculus or other foreign body, or a tumor in the urethra or bladder. In other cases it is due to an acute urethritis. In either class of cases the urethroscope or cystoscope will help materially in reaching a correct diagnosis. Again it may be due to a nervous or hysterical condition of the patient or some interference with the innervation of the bladder. In such cases a combined cystoscopic and gynecological examination will fail to show any obstruction to the outflow of urine and will in this way help to clear up the cause of the retention. In by far the greatest number of cases the obstruction to the urinary outflow is due to some condition extraneous to the bladder and urethra. Here, of course, the bladder examination will show no actual disease of the urethra or bladder, but the gynecological examination will reveal the true cause of the obstruction. To illustrate by a couple of cases: First case. I was called in consultation in June, 1908, to see a young girl who complained of increasing difficulty in emptying her bladder, and who was suffering a great deal of discomfort from a distension of this viscus. Her physician suspected a calculus, or other obstruction, in the urethra. The bladder could be felt as a tumor mass above the pubes and a catheter which was passed with some difficulty emptied the bladder

of a large quantity of urine. On examining the genitalia for some cause for the ischuria, I found a thick, bulging, imperforate hymen. A rectal examination showed the vagina to be markedly distended and evidently pressing upon the urethra, thus causing the difficulty in emptying the bladder. An incision through the hymen allowed the escape of one and one half pints of pus and caused an entire disappearance of the ischuria.

In another case I emptied the bladder of two litres of urine, the retention being caused by a retroverted incarcerated pregnant uterus. This case is by no means unique, as I have seen several similar ones, as has almost every physician who has had considerable experience in obstetrical and gynecological work. In like manner an inverted uterus, tumors protruding into, or of the vagina, impacted uterine or ovarian tumors which lie in the cul-de-sac of Douglas, abscesses or exudates lying in the cul-de-sac or adjoining the urethra, may cause the same symptoms. In carcinoma of the cervix or vagina, the cystoscope is of value in deciding for or against an attempt to remove the new growth. Take, for example, a carcinoma of the anterior portion of the cervix, when the growth has not apparently involved the broad ligaments, but where one is doubtful whether or not it has involved the base of the bladder and possibly the lower portions of the ureters. In such a case, at times, a bladder examination will prevent a very dangerous and useless operation, or else give the assurance that we can undertake the hysterectomy with the probability of success. I recall, in this connection, a case seen last summer at Columbia Hospital, where the cystoscopic examination left absolutely no doubt of the extensive carcinomatous involvement of the bladder by an extension from the cervix. In other cases, when the bladder is apparently involved, it has been conclusively shown that the induration and the bladder symptoms are not due to the cancer directly but to an inflammatory or edematous condition superinduced by it.

The systematic use of the cystoscope has cleared up in many respects the etiology of cystitis and pyelitis in puerperal and postoperative cases. At one time the whole blame usually devolved upon the nurse who had catheterized the patient subsequent to delivery or operation. Now it is quite generally believed that a large portion of the blame can be laid at the door of the injuries done the bladder by trauma caused by delivery or by operation. Colon bacilli can be introduced into a normal bladder which completely empties itself without provoking a cystitis, but in cases when a considerable portion of the bladder wall has been dissected from its attachments to the uterus and vagina, or has received serious injury from a difficult accouchment, the greatest care in catheterization will not, at times, prevent an infection. One cause of the high mortality of the radical operation for the removal of the carcinomatous uterus is the urinary infection which is largely due to the injury done the bladder and ureters by the extensive dissection necessary to the operation. Sloughs of the ureters and bladder causing urinary fistula are frequent sequelæ to these operations, and the cystoscope has shown after nearly all such operations ecchymoses and other evidences of bladder injury, and has caused such revisions in the operative technique as will tend to limit these injuries to the smallest possible extent consistent with a thorough removal of the new growth. The same thing holds good in hysterectomies for fibromyomata or inflammatory conditions of the uterus where unnecessary dissection of the bladder from the uterus is to be avoided.

It is frequently essential to the best interests of the patient to estimate the working value of the individual kidneys. The gynecologist is, at times, called upon to operate upon pyonephrotic or other conditions of the kidney where it is necessary to know whether or not the other kidney is healthy or diseased. In such cases chromocystoscopy and ureteral catheterization are of inestimable value. To-day one might expect sharp criticism were he to report the removal of a kidney for calculus or other condition in which the choice of operation lay between a nephrotomy and a nephrectomy in which he had not previous to operation found out the condition of the other kidney. The segregator is of value here, but it will probably fall into disuse on account of the greater value of the ureteral catheter.

In postoperative conditions where symptoms point to the ligation of a ureter it is of great value to pass the ureteral catheter to test the potency of one or both ureters. I recall most vividly one of my earliest operative experiences where I had ligated one ureter and upon discovering my error had cut the ligature, and where afterwards the patient gave symptoms of urinary obstruction in that side after the operation. Dr. Howard Kelly, whose assistance I sought, passed a ureteral catheter into the kidney with the disappearance of a temporary hydronephrosis and the symptoms produced by it, caused by what was probably an injury produced to the

mucosa of the ureter by the tightly tied ligature. The patient's life, at times, hangs upon the prompt discovery of a ligated ureter, and to subject a desperately ill woman to an exploratory operation to discover that the pain and lessened urinary output are not due to an obstructed ureter but to some other cause is most disquieting to any conscientious surgeon. The importance of making an early diagnosis in cases where both ureters are ligated or obstructed is very great. Unless it is made in the first 36 hours, according to one writer, the patient is probably doomed. Of course, there are difficulties in cystoscopy in such cases, and there may be obstructions to the ureters not due to ligatures, but the fact that the catheter will not pass into the kidney shows this and would probably call for a secondary operation. The cystoscope is also of great value in making a diagnosis of ureteral fistulæ or congenital conditions in which the ureter does not empty into the bladder but into the vagina. In such cases, although one may be sure that one ureter empties into the vagina, the cystoscope will aid in telling which ureter is at fault. Again, in vesico-vaginal fistulæ where the ends of the ureters are perhaps involved, it is essential that one should not include them in his sutures which are used in closing the fistula; and again, a knowledge of cystoscopy is useful to the gynecologist, for the interval openings must be located unless one is willing to take tremendous risks in operating.

The gynecologist is occasionally called upon to remove foreign bodies from the female bladder. Sutures which have worked their way into it from the site of a gynecological operation and perhaps formed the nuclei of stones, hairpins, catheters, masses of cocoa butter (all of which I have seen) are among some of the articles occasionally found. Now, while it is feasible to dilate the urethra sufficiently to introduce the finger, feel the foreign body and remove it by forceps, or to make an incision into the bladder through the anterior vaginal wall, it is easier, quicker, much less troublesome, and more agreeable to the patient to put her in the knee-chest position, introduce a Kelly or Rochester cystoscope, catch the body with a pair of alligator forceps under direct vision and remove it. I have done this in several cases and have saved the patient an incontinence of urine from over dilatating the urethra or else an operation for the removal of the body through an opening made into the base of the bladder.

To the obstetrician who is doing cystoscopy belongs most of the credit for our present knowledge of the pyelitis of pregnancy and the puerperium. The most notable articles which have been written upon this subject have been by men who are doing obstetrical work. This is what one would expect, for who can see so many cases as the director of a large obstetrical clinic?

To the gynecologist we owe our knowledge of the changes produced in the bladder by tumors in its neighborhood, either by distortion, pressure, or inflammatory changes. He has given us pictures of exudates which either have ruptured into the bladder or are about to do so, of suppurating tubal pregnancies or dermoid cysts emptying into this viscus, and he has contributed his share to our knowledge of those surgical diseases of the urinary organs common to men and women.

In my belief, the time is rapidly approaching when the use of the cystoscope will be more general in obstetrical clinics than the obstetrical forceps, and when no gynecologist will feel equipped for his work without a knowledge of it. This knowledge is not very easy to acquire, and as in other things in surgery and medicine, some know more than others, but all may acquire a proficiency by training and practice. I find some of my most interesting and satisfactory work along these lines.

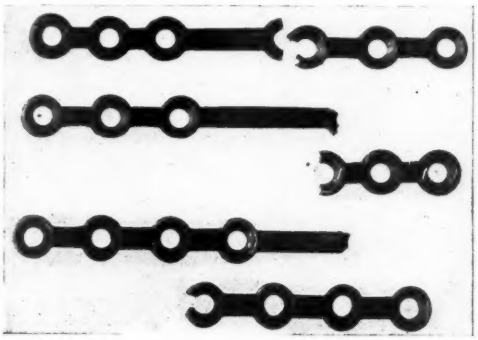
For the usual bladder examination and for ureteral catheterization, the indirect method by the Nitze or some similar cystoscope is the one usually employed. It is easier both for the patient and the examiner than the direct method. I examine bladders and catheterize ureters in my office in my routine work with little or no discomfort to the patient except in difficult cases. For the examination of the urethra, for direct application to localized areas in the bladder or urethra, for curetting ulcers, for removing off pieces of tissue, for microscopic examination, and for removing foreign bodies from the bladder, I use either the Kelly or Rochester cystoscope. In some cases this method is preferable to the indirect for the ordinary examination and ureteral catheterization, but the catheterization of the ureters free hand requires much more practice and more skill than the other, so that in the future probably few cystoscopists will acquire it. In conclusion, I would urge the physician who expects to specialize in gynecology or obstetrics to lose no time in fitting himself for this work, unless he is willing to dispense with one of the most useful methods of diagnosis and treatment of a considerable proportion of women who will seek his aid.

VANADIUM STEEL BONE PLATES AND SCREWS

By WILLIAM O'NEILL SHERMAN, M. D., Pittsburgh, Pennsylvania

DURING the past year we have been experimenting with the different kinds of steels used in the manufacture of surgical instruments, particularly the Lane bone plates. The object being to secure a grade of steel that would withstand the strain without fracturing. In a series of fifty-five cases in which the Lane plate was used, the writer was unfortunate enough to have three of them break. They were all fractures of the femur (middle third). The first plate broke as the final dressings were being applied; the assisting surgeon allowing the leg to drop a few inches, putting the strain upon the plate. Although this strain was not great, it was sufficient to cause the break which was distinctly felt through the tissues and dressings, and the condition recognized. The sutures were removed and bones replated. It was found that the screws were intact and that the plate had broken at its weakest point; i.e., the junction of the cross bar and first screw hole. This has been the breaking point in all the cases of which we have any knowledge. The early recognition and repair resulted in no ill effects, the patient making a perfect recovery. The second case was due to the continual tossing and restlessness of a most nervous patient, who, in spite of warnings repeatedly given, persisted in tossing about. Having had the experience of feeling a plate break under very slight strain, it was thought expedient to have a skiagram taken. This was done on the fifth day and showed an over-riding of the fragments with the screws intact and plate broken at the same point as in the first case. The patient was operated upon immediately, a new plate and screws being inserted. The recovery was uneventful. In the third case, a skiagram was taken six days after operation, showing screws and plate to be intact. The patient was an excellent one and remained absolutely quiet, so far as we could ascertain. At the end of ten weeks, before the patient was allowed out of bed, another skiagram was taken, which showed that the plate had broken at the same point as in the two preceding cases. There was an angular deformity present, with bony union. The patient made a good recovery, there being but slight interference with function, at the present time.

In view of these experiences, we proceeded to make a series of chemical and physical tests, so



Plates break at their weakest point: i. e., junction of bar and first eye.

that we might secure a steel that would withstand any reasonable strain after being placed in the tissues. I shall not describe these experiments to any length, other than to point out a few practical and most essential facts, which have not been given a great deal of consideration heretofore. Crucible steel and tool steel is the kind of steel usually employed in the manufacture of bone plates. An average analysis of which, would be

1 per cent carbon.
.30 to .50 per cent manganese.
.03 per cent phosphorus sulphur.
.15 per cent, or under, silicon.
Balance Fe.

Vanadium spring steel

.45 to .50 per cent carbon.
.70 to .90 per cent manganese.
.09 to 1.10 per cent chrome.
.03 per cent, or under, silicon.
.18 per cent vanadium.
Balance Fe.

The spring steels and tool steels usually contain a high percentage of carbon, these being the kind of steels from which bone plates have formerly been made. The lower carbon steels are preferrable to the high carbon steels on account of their greater ductility. Carbon and chrom are the chief hardening elements. The objection to the high carbon steels, is that while they possess great elastic limits, they are weak in ductility (toughness and bending properties). The latter property being necessary and essential

High carbon steel. Carbon steel.

Fractures as a result of bending test.

to insure against breakage. The high carbon steels, showing an elastic limit of 180,000 pounds per square inch, are too brittle and snap off or break with very little strain or twist. They do not bend, but break, as a result of the steel to "properly run." By this is meant, in the process of bending a molecular change takes place in the steel molecules. The outside molecules expand and the inside molecules contract. A failure of these molecules to properly adjust themselves, causes the break. The addition of vanadium intensifies the hardening elements, making the steel more dense and tough, thereby increasing the elastic ratio; i. e., ratio between the elastic limit and the elongation.

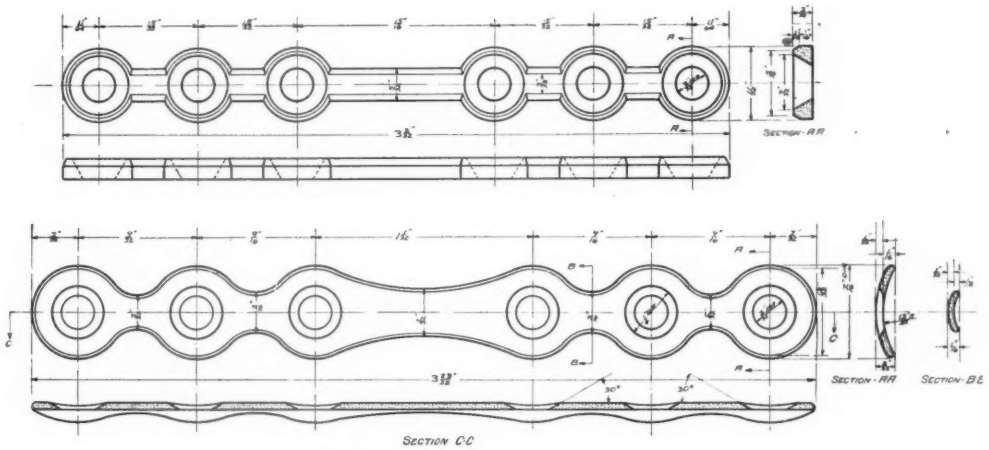
Vanadium chrome steel is two and a half to three times tougher than the high carbon steels, when properly treated. The ideal steel for use in a bone plate is one that has a sufficient elastic limit with the greatest ductility, so that in case a strain should be exerted, we would have a bending of the plate instead of a break. It would take a great force to bend a vanadium plate sufficiently to break it. It would take five hundred pounds, or over, to break a piece of steel the size usually employed in a bone plate (femur size). It will readily be seen that such a strain cannot be exerted in the human body. In the manufacture of vanadium steel, a charge of a quarter of one per cent of ferro vanadium is made into the ladle, open hearth method. The best steel is made by discarding approximately from 25 per cent to 30 per cent of the top of the ingot, with a view of eliminating segregation and possible piping or cavities caused by steel contraction. By steel segregation is meant the precipitation or impurities. The molecular arrangement in the cooling of a steel ingot, being similar to the molecular arrangement that takes place in the freezing of water into ice. The finished product contains approximately .18 to .20 vanadium.

Vanadium is found in Spain, Sweden, United States and various other countries in small deposits. It is found in commercial quantities in the Andes Mountains, Peru. The ore is mined and transported to the United States, where it is refined and placed upon the market in the form of ferro vanadium. The analysis of ferro vanadium being

.33 per cent vanadium.
.03 per cent, or under, silicon.
.02 per cent aluminum.
Balance Fe.

Vanadium acts as an intensifier of the other elements and also acts as a scavenger in removing the final traces of oxides and nitrides in the steel. A great many physical tests have been made of vanadium steel, which show conclusively that this new steel possesses physical properties not found in other steels. It combines the two qualities so necessary for a bone plate; i. e., elasticity and ductility. If the plates are properly made and treated, there should be no occasion for plates breaking in the future.

Vanadium steel plates, after bending and twisting tests.



Showing mechanical advantages of vanadium steel plate.

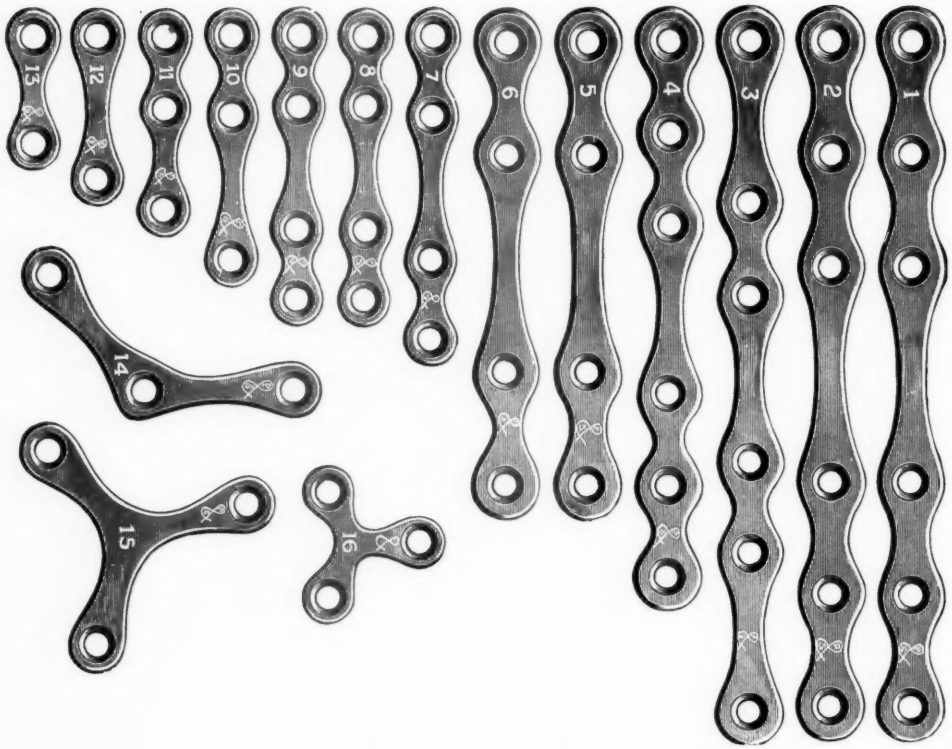
MECHANICAL CONSTRUCTION OF PLATES AND SCREWS

It is evident that the screws should also be made and constructed of the proper material, as a plate is of little value unless this detail is performed.

The photographs of the broken plates (eighteen cases reported) illustrate the point of most frequent fracture. In order that this weakness be overcome it was found necessary to reinforce the screw holes. There are many plates on the market in which there are from six to eight countersunk holes, these greatly weakening the plates at the point where the greatest strength is necessary. In the plates submitted and approved by experiments, the shoulder around the screw holes has been reinforced, there being a more equal distribution of steel. In the large femur plates the amount of steel in the plates can be reduced by gradually reducing the thickness of the plate as it nears the end; i.e. the cross bar and first shoulder gauge being $^{8}/_{64}$ (scant), the gage at the last eye can be reduced to $^{4}/_{64}$, without impairing the strength of the plate. The plate, if wide, should be concave, so as to permit of close apposition to the rounded surfaces of the femur. The new plates are patterned after the standard eye bars used in bridge construction. This bar has been proved by years of experience in bridge building, to be mechanically correct. By utilizing this idea and lessening the number of eyes in the plates, we have a plate that contains less steel and adds much to its strength. It is not necessary to have eight to ten screw eyes in a plate. The same ends can be accomplished by increasing the distance between the eyes, so that not more than six screws will be necessary to securely fix and hold a plate in position. We have proven this by experiments; the plate will, in the great majority of cases, break before the screws pull out, providing the screws have been inserted in hard cancellated bone. The amount of steel used in the manufacture of these plates can be greatly decreased on account of the greater physical properties. This will necessitate a smaller amount of metal which must be left in the wound, the advantages of which are quite obvious.

The screws should be so constructed that the thread is drawn up to the head, thereby giving the maximum efficiency of the screw. The slit in the screw should be broad enough to allow the use of a broad screw driver. If the slit is too narrow it will be found difficult to drive the screw home. The heads of the screws should be slightly rounded. This will add to the strength of the screw and at the same time minimize the countersink of the plate, by reducing the depth of the screw head. The deeper the countersink in the plate, the greater the danger of breaking. The holes in the plates and screws have been standardized.

In the manufacture of these plates it has been found to be of economic advantage to make a die and stamp out the plates. This process is open to criticism, unless done by one thoroughly familiar with steel tempering and an expert on instrument making. There is always a possibility that the plates might be broken by the dies, and that the break, not being visible to the



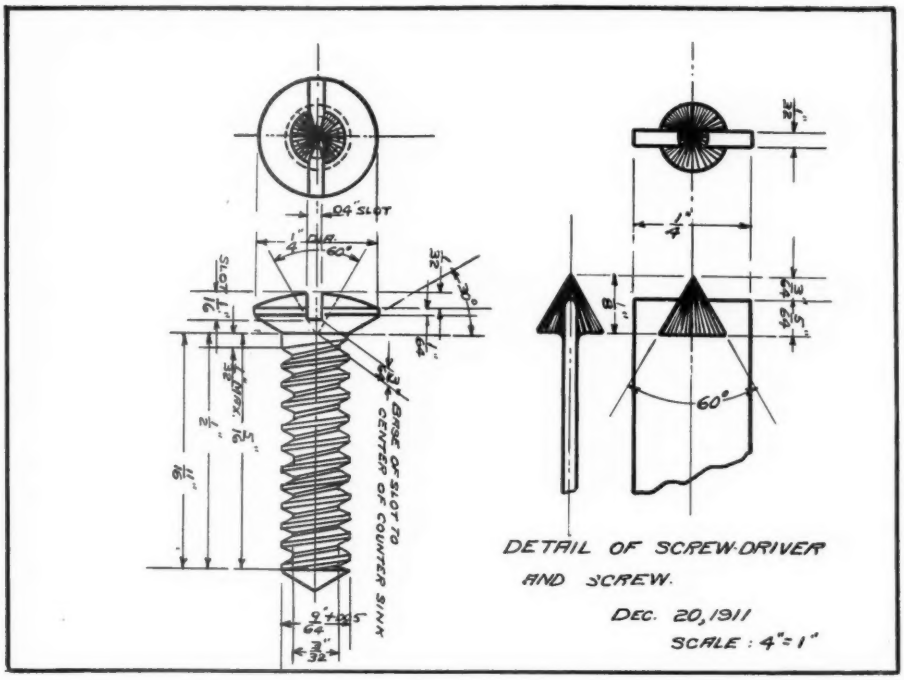
Set of vanadium steel plates.

naked eye, might give way later, after being placed on a bone. It would be wise to insist on a guarantee from the sales agent, so as to be sure that the plate is made of the proper material and thoroughly tested.

The success of the operating depends upon the proper fixation of the plate and its remaining in position. We can see no logical reason why silver plates should be used in preference to vanadium steel plates, in that steel possesses physical properties found wanting in silver. Silver is too readily bent, and of too low an elastic limit to be of much practical value. Aluminum is just the opposite, in that it possesses a very high elastic limit, but lacks bending properties. It has been proven that aluminum, silver and steel are non-irritants when placed in the tissues. In view of this fact, we feel positive that steel is the metal that combines the physical properties so necessary, and is at the same time a non-irritant to the tissues. It is advisable to have the plates and screws well "blued," to prevent oxidation before being used.

During the past two years we have removed seventeen plates in a series of fifty five cases. In several cases the plates were completely enveloped by hard cancellated bone, this removal being most difficult. If the plates are removed in from six weeks to eight months, or later, the tissues immediately surrounding the plates will usually be found stained with iron. This, however, is not objectionable. The screws were all found in position, as at the time of operation, it being necessary to thoroughly unscrew before they could be removed. In some cases the bone about the thread had softened sufficiently to cause the screw to become loose. However, there was no evidence of necrosis as a result of the use of plates and screws.

While Hansemann, some twenty-five years ago, introduced silver plates and screws for the repair of fractures, it remained with Mr. Ar-



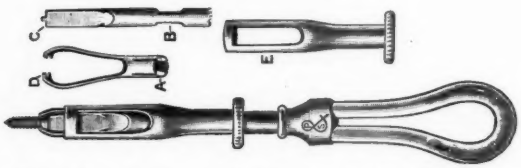
buthnot Lane, of London, to prove the practical superiority of steel to silver. Too much credit cannot be given him for the introduction of his steel plates and technique into surgery. It has placed the treatment of vicious fractures upon a safe and sane basis. While extremists have advocated the use of plates for fractures of all long bones, the concensus of opinion of surgeons to-day is, that the open method, in selected cases, is the operation of choice. We have reports of eighteen cases in which the plate has broken. In view of this, we consider it important to correct the mechanical and physical defects existing in the plates now offered to the profession. The failure to secure satisfactory results from the use of plates and screws has been due to the failure of surgeons to understand the underlying mechanical principles necessary for this work.

VANADIUM STEEL SCREWS

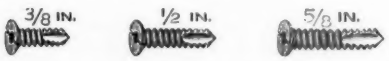
Wood screws as found on the market vary in size and are frequently made of soft steel. The cutting edge of the screw being too sharp to cut a thread into the bone without stripping. In many cases where screws have pulled out, or acted as plugs, the fault was found to be with the thread and softness of the steel. Bone is very hard and it takes a superior material to withstand the strain. There is no mechanical reason why a wood screw should be used when the self tapping machine screw answers all requirements. It has a much greater holding power than the wood screw and is much more readily inserted. Silver and soft steel screws do not have sufficient strength. The vanadium screw is the strongest and most practical screw for bone operations, in that it combines maximum strength with minimum quantity.

Attention is particularly called to special features of the screws used. The heads are rounded on the top, and the under side is tapered to fit the shallow countersinks provided in the bone plates. When in position, they offer no rough edges or projections, but present, with the plate, a smooth surface with a minimum of projection above the bone.

At the center of the slot a depression is formed which, when the screw is driven by the special screw driver, insures rapid driving by affording the operator means of quickly locating the slot, and by preventing the screw driver from slipping from the proper driving position.

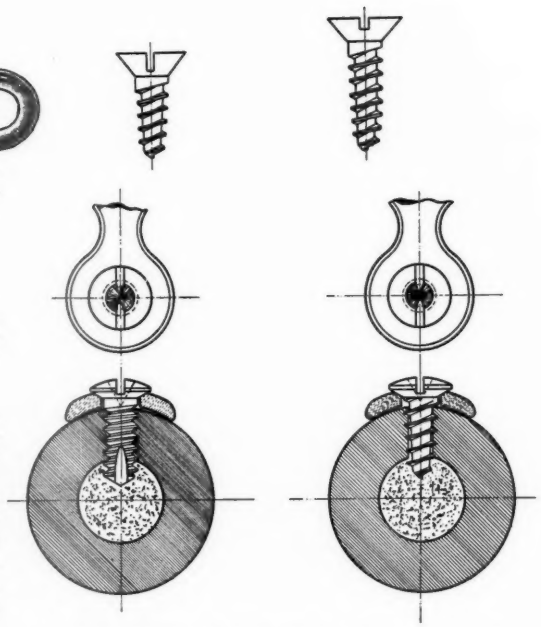


Screwdriver; special construction to fit tap screws. Center point fixes screw and insures vertical and direct driving.



Vanadium steel self-tapping (fluted) screws. Three flutes are provided at end of each screw, thus combining a tap and screw.

The threads are machine cut, of perfect shape, and of maximum strength for the amount of material used. The point, or entering end, of the screw is provided with three flutes which leave the cross-section of the thread exposed for a short distance. Each of these exposed threads are thus made cutting surfaces, or in other words, the point of the screw becomes a tap, which cuts a thread in the bone, into which the rest of the screw follows, without forcing or breaking up the bone structure, thus producing maximum holding power.



Showing machine and wood screws in position; greater holding power of machine screw.

The writer wishes to express to Drs. John B. Murphy and Edward Martin his appreciation for valuable suggestions; also to the Carnegie Steel Company, who have been very generous in making the many physical and chemical tests; and to the Harvey R. Pierce Company of Philadelphia for their assistance in making the plates and screws.

A DEVICE IN SUPRAPUBIC OPENINGS

By CHARLES MORGAN McKENNA, M. D., Chicago,
Surgeon to St. Joseph's Hospital and Cystoscopist to St. Bernard's Hospital

THE after-care of a patient carrying a suprapubic bladder fistula is one of the difficult problems that confront the surgeon doing genito-urinary work.

This question becomes even more actual after the primary applicance for drainage has been removed. Then the urine without any guidance overflows simply and wets the abdominal wall dressings, and bed of the patients. One of the greatest inconveniences is the almost intolerable smell that the urine decomposing in the bedclothes of the patient causes.

In order to avoid all that, and in order to keep the patient dry even when he is up and around I devised an applicance, a double rubber apron, described in the following lines, that is to be used on the fourth day after operation.

It will be noticed from Fig. 1 that the inner part of the rubber bandage fits very snugly against the body of the patient just below the wound, allowing enough space for a little gauze. Fig. 2 shows the bandage covering the gauze. Fig. 3 shows a cross-section of the pad and the direction of the flow. I have always used Lassars paste or Bandagene under the rubber to prevent chafing due to sweating. It is highly important to remove the bandage at intervals of 10 hours, to have a chance to clean thoroughly. I became convinced that this bandage affords the patient more comfort than any other factor. Its use minimizes the care of the attendant, and does away with the offensive odor. This device works better with fleshy patients.

In the past bladder patients were either isolated into a single room or else had to endure the unpleasant remarks of their ward comrades. It has been nearly essential to keep the patient out of the general ward or have a special attendant, but by using the above shown pad, the bladder patient can enjoy the society of the ward as well as any other surgical case. Where the service is large it is well to have a separate ward where this class of cases can be exclusively treated, both for the comfort of the patient and the general results.

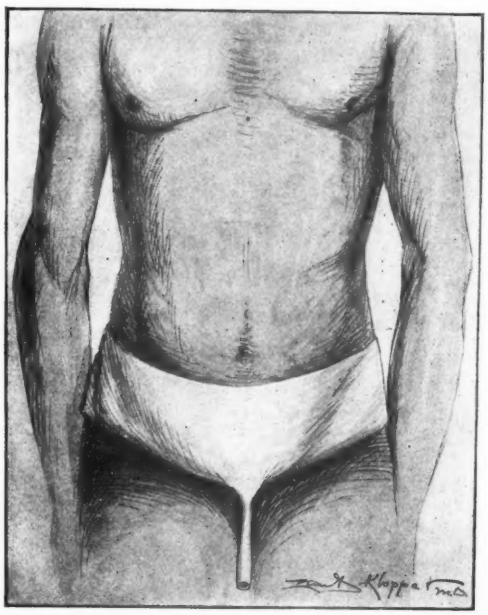


Fig. 1.

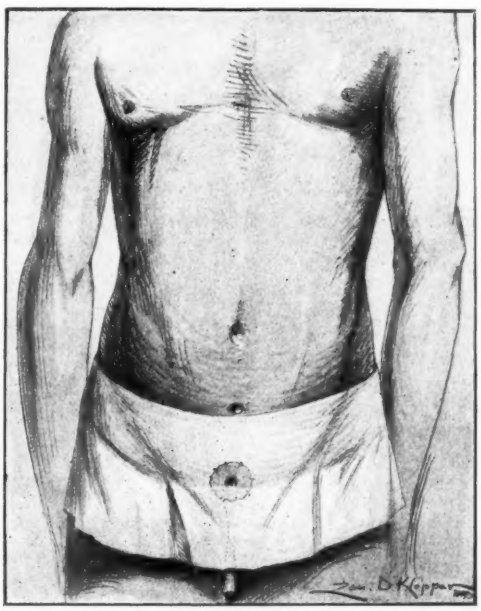


Fig. 2.

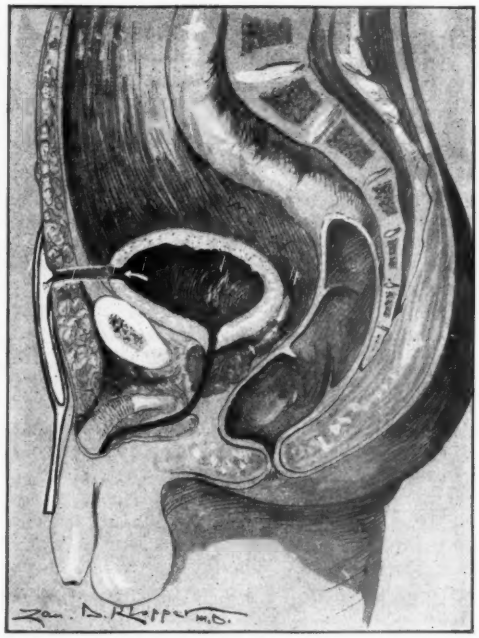


Fig. 3.

By so doing, the nurse familiarizes himself with the necessities of the patients, and will treat each case with a great deal of intelligence.

If during the first three or four days after the operation the tube in the bladder is connected to a tube outside of the bed and the urine drained off, the wound is kept perfectly dry and clean, and as a result primary union has taken place up to the tube; thus a small fistula from the bladder is established which makes it quiet easy to apply the apron without interfering with the newly healed wound. Hence the pad can be used with more satisfaction than if the wound is gaping or if there is more than one opening through the skin, which is often the case, when the urine is allowed to flow over the wound. Owing to the age of this class of patients it is highly important to have them in sitting position after the operation.

I might mention that this device works equally well in any posture and may be worn while walking about. The urine can be drawn without removing the pad, which is convenient both for the patient and nurse.

In conclusion, I wish to say that the chief aim of the device is to keep the patient dry and make him comfortable, thus reserving his strength and minimizing the work of the attendant.

LARGE CYSTS OF THE URACHUS

With Report of Two Cases

By J. F. BALDWIN, A. M., M. D., Columbus, Ohio
Surgeon to Grant Hospital, etc.

ALL surgeons are, of course, more or less familiar with the urachus, which, as seen in ordinary abdominal operations, appears merely as a fibro-muscular cord extending from the summit of the bladder to the umbilicus, and lying in the connective tissue between the transversalis fascia and the peritoneum. It is probable that this embryonal structure not infrequently fails to become obliterated, but persists either as a sort of infundibulum at its attachment to the bladder or as a more or less beaded cord, the beads being simply small cysts distributed along its course. These small cysts are devoid of surgical interest, as they are without pathological significance. On very rare occasions, however, the urachus develops into a cyst which, growing in the direction of least resistance, comes finally to more or less completely fill the abdominal cavity, simulating, as a rule, an ovarian tumor. This subject has been studied by different writers, but the most exhaustive article with which I am acquainted is that by Alban Doran, of London, in volume 81, of the Medico-Chirurgical Transactions, to which article the interested reader is referred.

Mr. Doran reports a single case, his patient being a woman of 59, who had presented an abdominal tumor for only a few months. This tumor was spherical in outline, and occupied the middle line of the abdomen from the umbilicus to the pubes, bulging a little more to the left than to the right. He operated under the diagnosis

of an ovarian cyst. In his monograph he refers to cases reported by Lawson Tait, Edward Ill, Douglas, Byron Robinson, and others. In some of the cases reported the cysts were comparatively small, but in some they were very large, and the diagnosis, even at the time of operation, difficult and perhaps uncertain.

In my own work, which embraces about seven thousand sections, I have seen a number of the small and unimportant cysts; a larger one in an infant, which, having become infected, with resulting abscess, was opened and drained; but the infection was so severe as to result in death not long after the child left the hospital; and two in which the tumors nearly, or quite, filled the abdomen. The latter two are deserving of report, particularly as in the second I had the opportunity, unique perhaps, of reopening the abdomen some months later.

CASE 1. Mrs. C. L. R., Shenandoah, Ohio; physician, Dr. J. M. Frye; aged 33, married 12 years, one child, aged 11 years; labor normal, miscarriages none, appetite fair, but much vomiting; kidneys normal; menstruation normal. Patient had suffered from her present trouble for about a year, but no diagnosis had been made until about three weeks before I saw her, which was March 29, 1901. In the previous July she had had a feeling of fullness, and was as large as though pregnant six months. In September much of this fullness disappeared, but it again increased. When I saw her the uterus was pushed forward and to the right by a tumor which did not seem to involve the uterus, but which extended from the pubes to the umbilicus. This tumor was cystic, and apparently about the size of an adult head. It could not be said to be movable, but did not seem to be very firmly fixed. Dr. Hunter Robb, of Cleveland, and myself saw the patient together in consultation, and assumed that the tumor was ovarian.

She came to Columbus and was operated upon April 24, 1901, Dr. Frye being present. When under the anæsthetic the uterus was found, as before, pushed forward against the bladder, and the cyst could be very distinctly mapped out. On opening the abdomen we found the transversalis fascia to be much thickened. It was dissected through with great care. On getting through there was a gush of pus. With the fingers on the inside the incision was enlarged sufficiently for thorough examination. A large quantity of pus was evacuated, together with a considerable amount of more or less necrotic material, resembling somewhat disintegrated omentum (as in one of the cases mentioned by Doran). The cavity having been entirely cleaned out, the sac was found to be a smooth and rather thick membrane. The peritoneal cavity itself had not been entered. In the pelvis the uterus was found standing up, as it were, distinctly in the cavity, though covered by the membrane, as were also its appendages. The connection of the membrane to the surrounding parts seemed to be so firm as to render any attempt at its enucleation undesirable. The cavity was therefore drained, the incision being only in part closed.

Patient stood the operation well, made an excellent operative recovery, and returned home in due time. Dr. Frye reported, under date of March 15, 1904, that the fistula which followed the drainage had closed only about four months before. Patient had been warned as to the probability of a hernia. Under date of September 17, 1911, patient, in response to a letter of inquiry, reported that her health was as good as ever. From her letter it is evident that there is a small hernia at the point of drainage which perhaps should be operated upon but seems to be making no special trouble. Menstruation perfectly regular. Has had no further pregnancies.

CASE 2. Irene F., aged 6 years, Newcomerstown, Ohio. Physician, Dr. Hosick. Patient had been taken suddenly sick about three weeks before. The pain seemed to be in the neighborhood for the appendix, but somewhat below McBurney's point. Slight elevation of temperature. Thighs flexed. Amount of pain quite variable. Bowels regular. No appetite. A little before she came to the hospital the abdomen became much distended and painful. Pulse more rapid. Temperature 100°. The presumptive diagnosis had been appendicitis with enormous abscess formation. When the patient reached the hospital, (May 7, 1911) the abdomen was considerably distended and tender throughout, and with distinct fluctuation. There was perhaps a little more tenderness in the appendix region than elsewhere, but this was not marked. Diagnosis very doubtful, but the case clearly one for exploration.

When the patient was under the anæsthetic could determine nothing more about the case. No lump in the region of the appendix. Made the usual median incision. As soon as the incision was made there was an escape of a large amount of rather thin, yellow, odorless fluid. The opening was enlarged, and the cavity thoroughly flushed out, the water bringing out a large amount of what seemed to be necrotic lymph. The cavity was found to be bounded below by the pelvis, above by probably the transverse colon and the stomach. It extended on each side clear to the flanks. The intestines were crowded back by the posterior wall of the cyst. The uterus in this case, as in the former, could be readily felt, though infantile in size, below the membrane. Introduced drainage, with partial closure of the incision. The patient made a smooth convalescence, and returned home in the usual time, with distinct warning as to the probability of a hernia.

September 3, 1911, patient returned with her mother because they had noticed a beginning hernia. The hernia was operated upon the next day. Incision made directly through the old scar, dissecting down very cautiously, as I expected to find extensive adhesions. On finally opening the peritoneum, I found that the abdominal contents were in every respect absolutely normal, except for two cobweb adhesions of the omentum to the anterior abdominal wall. The appendix was brought up and found to be entirely normal. Was removed on general principles. Pelvic organs normal. In fact, had one not familiar with the previous history of the case made the operation, he would have found nothing whatever to suggest any previous trouble in the abdomen. In other words, the sac had absolutely disappeared. The bladder, however, seemed to be a little higher up than usual, though even that was not positive.

So far as I know, this is the only case of urachal cyst in which opportunity has been afforded for an examination of the abdominal contents after recovery.

TRANSACTIONS OF SOCIETIES

THE CLINICAL CONGRESS OF SURGEONS OF NORTH AMERICA AND THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

COMBINED MEETING OF THE SECTIONS ON OTOLOGY, LARYNGOLOGY AND OPHTHALMOLOGY, WEDNESDAY, NOVEMBER 15, 1911

The meeting was called to order at 8.20 P. M., DR. GEORGE E. DE SCHWEINITZ, President of the College of Physicians, in the Chair.

DR. DE SCHWEINITZ: At this meeting of the combined sections on Otology and Laryngology and on Ophthalmology of the College of Physicians, I have been asked, through the courtesy of the President of the Section on Ophthalmology and the President of the Section on Otology and Laryngology, to preside. Therefore I have the honor to bid you welcome to the evening's entertainment. The first scientific paper is one by Dr. Joseph H. Bryan, of Washington, D. C., on "The Surgery of the Sinuses and Its Relation to Orbital Complications." I have the pleasure to introduce Dr. Bryan, of Washington.

DR. JOSEPH H. BRYAN, Washington, D. C.: I have changed the title of this paper somewhat. I made an earlier contribution on this subject some years ago. That paper was read before a meeting of the American Medical Association at Columbus, in 1894. I myself was unable to be present at that meeting, but my paper was presented by Dr. Randall. It was entitled, "A Contribution to the Diseases of the Accessory Sinuses and the Eye," and was the first to be presented before a joint meeting of the Sections on Otology and Laryngology and on Ophthalmology. My present paper is entitled, "A Further Contribution to the Study of Diseases of the Accessory Sinuses in Relation to Diseases of the Eye, and the Surgical Methods to be Adopted for their Relief." (See p. 565).

DISCUSSION

DR. R. W. PERRY, Seattle: I should like to ask Dr. Bryan whether he has had any success in the treatment of diseases of the accessory sinuses by means of bismuth paste.

DR. DE SCHWEINITZ: The subject to which the essayist has called our attention is so important (and for this presentation we are much indebted to Dr. Bryan) that I would like to add a few words to those which you have heard. Among the interesting visual field phenomena which have been described are the so-called van der Hoeve scotomas. As we all know, this observer (and his observations have been confirmed by de Kleyn and others) has shown that before either optic neuritis or retrobulbar neuritis appears in sinus disease, there may be an enlargement of the blind spot; or it may be surrounded in its enlarged state, or without this, by rings of color scotoma. With the relief of the sinus disease, this condition of affairs disappears. The important fact that these scotomas may antedate, sometimes by a considerable period of time, the organic changes in the optic nerve, cannot be too frequently emphasized. By the presence alone of such scotomas, the necessity of operative interference, especially as this relates to ethmoiditis and sphenoid sinus disease, may be determined,—determined, moreover, before ophthalmoscopic lesions have developed. The members of the Section of Otology and Laryngology of the College of Physicians will remember that this subject has been discussed in their presence by the younger Dr. Risley and by myself, when we brought before the section our observations on this important matter, confirming those which have already been recorded by van der Hoeve and others.

The essayist of the evening has in full elaboration pointed out the conspicuous ocular manifestations of sinus disease, but I would like to refer to others, not so conspicuous, and yet none the less equally diagnostic in value, and for this purpose I shall quote from some previous writings of my own on this subject. All of us are well acquainted with edema of the eyelids, so conspicuously evident in acute ethmoiditis, antral and frontal sinus disease, sometimes present for long periods of time, and sometimes appearing in the form of a typical recurring or fugitive edema. Occasionally, however, in place of the edematous manifestation there is an actual

blackening of the lids suggesting an ecchymosis, which, like the simple edema, recurs from time to time. It is important to take these manifestations into consideration, because fugitive edema of the lids under these circumstances has not infrequently been mistaken for an angio-neurotic edema, or for the common fugitive edema which is present in certain types of migrain.

A still more interesting ocular symptom of sinus disease is the phenomenon which I have described under the name of fugitive episcleral congestion, which resembles somewhat the fugacious periodic episcleritis of Fuchs. This, of course, must be distinguished from the well-known congested conjunctiva and watery eye, so constantly present in sinus disease and which is one of its well known signs. Like fugitive edema of the lids, it comes and goes, and differs from ordinary episcleritis in the deeper hue of the dilated and tortuous vessels and in the association of violent headache. These attacks may sometimes last for weeks or even months, before their real etiological factor is discovered. They may also be associated with blurred vision, which is due to a concomitant edema of the corneal epithelium, which under these circumstances somewhat resembles the appearance that is produced by the prolonged action of cocaine. I may refer in this connection to the case studied with me by Dr. S. D. Risley, Dr. Randall and Dr. Freeman, of a young woman who, after several months of these recurring episcleral congestions, the nature of which was totally unsuspected, developed a gradually increasing blindness associated with central scotomas, vision having been reduced to bare light perception, all dependent upon a slight purulent sphenoiditis.

The ordinary central scotomas of sinus disease, such as have been described by Jessup, Fuchs, Birch-Hirschfeld, Knapp and many other observers, are well known; but there are some unusual forms of these scotomas which deserve additional attention. In the patient to whose case history I have just made reference they assumed at first a paracentral form, and gradually developed into hemianopic scotomas, somewhat resembling the hemianopic scotomas of Treitel, and slowly reaching a central position, where for long periods of time they maintained their position, until, after treatment, partly intranasal and partly operative, by Dr. Freeman, the condition was relieved; and the patient to-day has practically normal vision. I have also seen, especially in this girl, a ring scotoma as the first manifestation of sinus disease, in turn developing into a complete central scotoma, and these ring-shaped scotomas have recently attracted considerable attention. Considering the situation of the sphenoid sinus disease, it is not difficult to understand that there may be a temporary paracentral or hemianopic scotoma. All of this work affords an excellent example, as the essayist has pointed out, of the importance of special branches of medicine and surgery keeping in touch with each other's work and observations, and by such study, greater precision in diagnosis, and consequently in therapeutic application, is acquired.

Dr. S. D. Risley, Philadelphia: I have been much interested in the admirable paper presented by Dr. Bryan. In most respects, the teaching of the paper, is strictly in accord with my own experience with the class of cases under study. I have been rather disappointed that Dr. Bryan in his paper has said so little about the etiologic factors in sinus disease, and that the Chairman has also omitted this important consideration in his remarks about the fields of vision associated with this group of cases. I have not always been able to differentiate the fields of vision, and intraocular states as shown by the ophthalmoscope, when actually due to sinus disease, from the same group of ocular symptoms associated with general toxæmias, in cases where there was no plausible reason for suspecting the presence of sinus disease.

By way of illustration, I would state that I have not infrequently seen central scotomata and narrowing of the fields of vision, sometimes transient, but too frequently permanent, in cases where the ophthalmoscope had shown more or less well marked œdema of the fundus, veiling all details, with large, dark veins tortuous to the limits of the ophthalmoscopic field, occasionally with hæmorrhages in the fibre layer of the retina or at the macula, and all this, in cases where it was impossible to demonstrate the presence of disease of any sinus. On the other hand, I have again and again seen the same group of symptoms associated with disease of one or more of the sinuses in the anterior segment of the skull, but have not always been able to say that the ocular states were due to the disease of the sinus, since both the ocular and sinus affections were associated with and probably due to the existence of a general autotoxæmia. Nevertheless, I am firmly convinced of the contention Dr. Bryan has made in his thesis, namely: that ocular affections are not only frequently associated with sinus disease, but are, in fact, due to that disease; but I feel that it is of great importance to bear in mind that both affections are due to the same cause, and that both are frequently relieved by suitable

general treatment. I have been very much impressed by another fact set forth in the cases related by Dr. Bryan, namely: the importance of early diagnosis in sinus disease. When recognized early, it is frequently possible to prevent the occurrence of the necrotic conditions described, and so avoid the serious operative measures set forth in the paper.

Dr. John E. Weeks, New York City: I wish to call attention to the fact that in these cases the unilateral character of the condition is a very important point indeed. From what I have heard this evening, I would infer that both eyes are affected, as a rule, but that, in my experience, is not the case.

Dr. Bryan (closing the discussion): I have never used bismuth paste in the treatment of sinus disease, and cannot say how it would act. I know that it has been used in many instances, but it has not been employed by me. In regard to bilateral affections of the eye, I might say that in one case in which there was a bilateral change, there was an abscess on one side and a mucocele on the other. Nerve toxæmia can take place from mucocele, as well as from an abscess; and that may have given rise to the change in the other eye. I think, however, that when these bilateral conditions exist, they are probably due to anomalies that occur in the posterior cavities. You never can tell to what extent the nerve of one side is involved alone; for, as has been stated in the paper, the sphenoid may be in relation to both nerves, or the posterior ethmoid cells may affect one nerve and not the other, and I believe that the inflammation may be transferred through the chiasm to the other nerve. These are very obscure and difficult questions to contend with, and I am not able to throw any light upon them.

Dr. de Schweinitz: The next paper is "The Relation between Otitic and Intracranial Diseases," by Dr. Gorham Bacon, of New York City. (See p. 579.)

DISCUSSION

Dr. B. Alexander Randall, Philadelphia: The beautiful presentation of the subject that Dr. Bacon has made leaves little or nothing that I can add to its terse breadth or its sane clearness. I am sure that our failure to discuss it and to go into the various details will not be regarded by him as any lack of appreciation of his paper on our part. I believe that I voice the feeling of those present in saying that we need not multiply words on this matter, and as we still have before us another admirable paper, I will not further take up your time.

Dr. de Schweinitz: Two surgeons are present who have had a large experience in intracranial surgery, Dr. Davis and Dr. Taylor. Would either of you like to say anything on the subject? If not, is there any further discussion? Then Dr. Bacon will close the discussion.

Dr. Bacon: I only want to rise to thank you and the members of the society for the honor of being invited here and the privilege of making these few remarks this evening.

Dr. de Schweinitz: The next paper of the evening is on "The Newer Operations in Glaucoma," by Dr. John E. Weeks, of New York City. (See p. 570.)

DISCUSSION

Dr. Walter L. Pyle, Philadelphia: From my necessarily limited experience with cyclodialysis, I do not believe it is a primary elective operation for glaucoma. I think, however, that in certain cases of painful blind eyes with high tension, cyclodialysis may be of value and spare the necessity of enucleation. On the other hand, I believe that posterior sclerotomy may be the operation of primary election in certain cases of acute glaucoma brought on by artificial mydriasis; as, for instance, after instillation of euphthalmin or homatropin. Nine years ago I saw such a patient with incipient cataract. To examine the entire lenticular area, I instilled one drop of homatropin (two per cent. solution) in each eye. She left the office with no apparent signs of discomfort, and no signs of glaucoma. At three o'clock the next morning, she awoke with excruciating pains in her eyes; and at nine, I found her entirely blind with double acute glaucoma. There was no light perception; she could only feel the heat from the lighted candle on her face. The eyeballs were stony hard. I decided to perform double posterior sclerotomy. Entering a von Graefe knife quite posteriorly in the lower segment of the eyeball, along the meridian, I let out a bead of vitreous, and then used dionin. This was over eight years ago, and then the use of dionin was not in great favor in Philadelphia, although there had been some encouraging French reports on it. I also gave a hypodermic of pilocarpin, to produce profuse sweating. The pain was relieved immediately, and on the next day the patient began to see. By the fourth day she seemed to have quite recovered her vision.

I reported this case soon afterward, at a meeting of the American Ophthalmological Society in Washington; and I have seen the patient every six months for the last eight years. I saw her yesterday, and the visual fields were then intact and the color sense uninvolved. The tension is practically normal, and corrected visual acuity is

perfect. At the time of the report several members of the Society sceptically suggested further communications. I have been giving periodic additional reports on this case ever since.

This is not my only case of the kind; and I believe that in all cases of artificial acute glaucoma in the middle-aged, the elective operation is a posterior sclerotomy, followed by the use of dionin and eserin and pilocarpin. In chronic cases, dionin is of less value, as the eye soon develops a tolerance for it. I have often used powered dionin when solutions were insufficient to produce the desired lymphagogic action.

Posterior sclerotomy is an easy operation, and I think it safe to recommend it as a primary procedure in very violent acute cases of glaucoma. An iridectomy is often complicated with some wound of the lens-capsule, particularly if the corneal incision is made with a cystitome. Posterior sclerotomy is much easier. A subsequent iridectomy can be done much more easily after the surgeon has first reduced the tension by means of the scleral incision, and often there will not be a necessity to resort to final iridectomy. I have never had serious vitreous hæmorrhage after posterior sclerotomy. I invariably make my scleral incision below, well back, and in a meridianal direction. I have several times seen slight hæmorrhage into the vitreous entirely absorbed in a few days.

Dr. L. Webster Fox, Philadelphia: All present here to-night thoroughly appreciate Dr. Weeks' admirable review of a subject which has from time immemorial played a very important role in diseases of the eyes, and no one has followed the operative methods for the relief of glaucoma with closer attention than myself. I have practised iridectomy for many years, and that is my operation of selection at present. As these newer operations were developed, I paralleled the cases; that is, I performed an iridectomy on one eye, and the newer operation on the other, in such cases, when the disease existed in both. Under such favorable clinical conditions, I have been able to make very accurate deductions as to the relative value of the different methods.

Recently I had an opportunity of examining two cases of chronic glaucoma that had been trephined by Major Elliot himself — patients of Dr. Bickerton, of Liverpool, England. They were beautiful operations; and after six weeks, the tension, which before the operation had been stony hard, the eyes being painful, was practically normal to touch; and all pain had disappeared. Since my return home, I have repeatedly performed the Elliot operation with his trephine; but I found it a difficult instrument to manipulate. Recently I had a modification of the Von Hippel corneal trephine made, and I can assure you that it has many advantages over the Stephenson or the Elliot trephine. I have also performed the La Grange operation, using the special instruments devised by himself, and carrying out the details as carefully and skilfully as I could. I found, however, that after a certain time — notably on account of the blocking of the filtration wound—the tension would ascend to $+2-3$, necessitating a sclerotomy after the method of De Weckers. Of these newer operations, Herbert's, La Grange's, Elliot's, and Freeland Fergus's, I am especially interested in the Elliot operation, having seen the results of this surgeon's work. Up to the present, I have ten Elliot operations under observation in the Medico-Chirurgical Hospital.

We, as ophthalmic surgeons, are awaiting the operation which can be performed by the average surgeon with safety and, at the same time, if possible, retard the disease. I consider the operation of iridectomy for glaucoma the most difficult in the whole range of ophthalmic surgery; and, as I said a few moments ago, we welcome an operation that holds out the possibilities of the Elliot method. In acute glaucoma, I certainly believe in that reliable method which has stood the test of time, iridectomy. In chronic glaucoma, the closing of the chapter is different. I feel that we must go beyond operative measures. In some cases — a great many — we have to deal with high arterial tension — arteriosclerosis, and all that that implies.

Recently I had a patient under observation for acute glaucoma, with a blood-pressure of 265 mm. Eserine, very freely applied, did not contract the iris. A year before, the left eye had been similarly attacked; and as this high blood-pressure must have existed at this time, an account of the history of an enucleation immediately following an attempted iridectomy was significant. Taking advantage of this history, and feeling that discretion was the better part of surgical valor, I had twenty ounces of blood taken from the patient's arm. It was surprising to see the contraction of the iris when the blood-pressure fell to 150 mm., as registered by the sphygmomanometer. The anæsthetic may also have had its influence on the iris, but, nevertheless, I was able to perform a successful iridectomy, with the patient having good vision at the present time. I believe that successful medication will assist us in our operations for this dread disease, be they the Von Graefe or the Elliot.

DR. DE SCHWEINITZ: I would like to say a word about the La Grange and the Elliot operations. Dr. Weeks's large experience with La Grange's operation permits him to speak with authority. I have not so large an experience from which to draw, but with this operation I have had a number of excellent successes, and yet it is true that occasionally filtration apparently ceases. For example, a patient on whom I performed this operation last March, each eye having been submitted to operation, had a perfect result, and a typical La Grange filtering cicatrix was evident for many months and the tension remained normal. Some time during the present summer, however, the filtering cicatrix gradually disappeared; and to-day, although the iridectomies are perfect, it would be impossible to tell that there had ever been a true filtering scar, and in this respect this case illustrates the accuracy of Henderson's criticism. Now it may be that a sufficiently large piece of sclera was not abscised, but I cannot help believing that the ingrowing of epithelium is likely in many instances after a time to check the filtering process.

During a visit to Europe last year, I saw the results in a number of eyes submitted to Elliot's operation; although I did not see the operation itself performed. These results led me to try it on my return to this country. The first patient on whom I operated, a man blind from secondary glaucoma, the result of intraocular hæmorrhage, came for the purpose of having his eye enucleated to relieve severe pain. When the general anæsthesia was complete, I determined to try the result of an Elliot trephining. The tension had been very high, between 40 and 50 mm.; and immediately on completion of the operation the tonometer registered only 5 mm. This reduction of tension remained for twelve or fourteen hours, and then the tension slowly returned, rising again to between 40 and 50 mm. Again it fell under the influence of hot compresses, dionin and eserin, and for thirty-six hours the patient had perfect comfort. Subsequently, with the renewal of high tension, the pain returned, although not so severe as it had originally been; and the patient was unwilling longer to retain his sightless globe. It, therefore, has been enucleated, and will be submitted to microscopic examination, and should afford a study of some very interesting microscopic sections. In another patient blind from chronic glaucoma, inasmuch as there was not even light perception, the tension having been 53 mm. just prior to the operation, the reduction was again excessive, the tonometer measuring 5 mm. at the conclusion of the operation. I have never measured the tension of a glaucomatous eye immediately after the performance of an iridectomy, so that I cannot present a table of comparisons; but the observation, as far as it goes, seems to me to be an interesting one. In the few operations of trephining which I have performed, there have been no reactions. I have not found it a difficult operation, and it seems to me that it should have a satisfactory position in ophthalmic work. I have always used Stephenson's trephine, and although not as graceful an instrument as the Von Hippel, is none the less one which is perfectly satisfactory. If Major Elliot's directions are carefully followed, it does not seem to me there should be any difficulty in always entering the anterior chamber and certainly a simple trephining is preferable to one combined with a cyclodialysis, as in Fergus's operation.

DR. WEEKS (closing the discussion): I wish to say a word regarding posterior sclerotomy. The danger in performing this operation in *seeing* eyes is that of hæmorrhage from the large choroidal veins. I have employed this operation in *blind* eyes for the relief of pain in six cases, I think; and in all, the result has been very excellent indeed. The relief from pain and the reduction in the tension have remained for quite a long period of time — as long as the patients remained under observation. In operating, I make a shallow T-incision, and permit one or two drops of vitreous to escape.

Regarding the results of the La Grange operation, I think that the subsequent treatment has much to do with the success of the procedure; if one will employ massage for some period of time and use mydriatics, the results are certain to be very good. At the present time, I do not look on cases of glaucoma as being very threatening to vision, provided they come to me before the vision is much reduced.

As regards the Elliot operation, any operation that will make a permanent filtering cicatrix will give a permanent reduction in tension. If the cicatrix is open, the tension will remain low. It may not be quite normal; but it will be normal in many cases, and will remain relatively low. I think that the Elliot operation is as yet too young for us to decide whether it will produce a permanent filtering cicatrix or not. If so, it is the desirable operation. It can, of course, be repeated.

WASHINGTON SURGICAL SOCIETY

REGULAR MEETING HELD NOVEMBER 17, 1911, THE VICE-PRESIDENT, DR. BALLOCH, IN THE CHAIR

DR. TOM A. WILLIAMS read a paper on "Chronic Visceral Pain in Relation to Surgery and Psychotherapy." (See p. 595.)

DR. STAVELY said that in the case Dr. Williams referred to, the diagnosis seemed absolutely clear; there had been previous attacks, and an operation seemed indicated. The appendix was normal. She shortly went West and later returned with the condition mentioned. The result of the treatment was prompt.

DR. STONE had seen two of the cases mentioned and could testify to the efficiency of Dr. Williams' treatment, though one case had recently had some probable recurrence. The other case was one of intense spasm of the iliac muscles, following an operation for appendicitis. This spasm was persistent and not relieved by anæsthesia; an orthopædist also failed to relieve the spasm prior to Dr. Williams' successful treatment.

DR. CARR mentioned a remarkable case. A girl was operated on for appendicitis and got well. During her convalescence her sister developed appendicitis and she was sent to Dr. Carr for an interval operation. Dr. Carr removed a normal appendix; at the operation some small cysts of the ovaries were noticed; the pain persisted, the ovaries were removed but the pain become worse. Her physician insisted she had uterine trouble, and Dr. Carr, with considerable misgiving, took out the uterus. The symptoms persisted, and, unfortunately, an infected wound gave her a ventral hernia. An Atlanta surgeon operated on the hernia and a fæcal fistula resulted. She afterward had two operations for the fistula. She was always smiling and lost no flesh. She had seven operations, and Dr. Carr doubts if she should have had any. She probably got well because there was nothing else she could imagine she had.

DR. WILLIAMS said he had mentioned only cases which had been thoroughly explored by the surgeon and organic trouble excluded. He does not advocate psychotherapeutic trials in abdominal pain, when there is any possible doubt; in doubt, it is best to wait. Dr. Stone's statement, that the contractions persisted under anæsthesia, was interesting; as we expect psychosthenic spasm to disappear under anæsthesia. Psychotherapy should supplement surgical procedures, not supplant them.

REGULAR MEETING HELD DECEMBER 15, 1911, THE VICE-PRESIDENT, DR. BALLOCH, IN THE CHAIR

DR. FRANCIS R. HAGNER reported a case of a man, age 42, where cystoscopy showed a papillomatous growth. Cauterization with the Oudin current revealed a carcinomatous growth of the base. Suprapubic cystotomy for drainage was done. The man was advised to have his kidneys drained posteriorly and to have the bladder removed, but he refused external drainage. The Fowler operation of implantation of the ureters into the rectum was done. Some difficulty was experienced in isolating the left ureter because of dilatation and resemblance to a vein. The prostate and rectum were not involved and as the operation had to be hurried to a close, owing to the patient's condition, the prostate was not removed.

DR. MILLER, in discussion, thought the undertaking too formidable for one sitting; no doubt the best plan is to drain ureters externally to the back and remove the bladder later. The so-called flap of mucous membrane devised to prevent ascending ureteral infection looked well on paper, but in the process of healing doubtless loses its efficiency.

DR. KERR remarked that by lifting the sigmoid, the mesentery tends to drag the ureter away from the pelvic wall and thus disclose its location.

DR. FOWLER said it was a serious question as to whether the operative chance in a case like this justified the risk, and yet it offered the only chance. Implantation into the bowel had proven unsuccessful, infection practically always occurring.

DR. HAGNER said he had first intended to use two stages, but the patient had refused external drainage. He agrees with Dr. Miller and Dr. Fowler as to the difficulty of preventing ureteral infection; satisfactory valves no doubt could be made in the thicker intestine of dogs, but he did not think it practicable in man. The ureters were cut about one inch from bladder and the ends implanted into the median line of rectum without difficulty.

DR. MILLER read a paper, "The Cystoscope in Gynecology and Obstetrics." (See p. 625.)

DR. I. S. STONE complimented Dr. Miller for his work along this line at the Columbia Hospital. Cystoscopy is absolutely necessary to the success-

ful treatment of these cases. He mentioned a case having pain along the left ureter, and bloody urine. Pelvic examination showed probable thickening of the left ureter, but cystoscopic examination showed the blood to come from the right ureter. Strange to say, the ureteral catheterization seemed to cure the case.

DR. HAGNER said the paper was most valuable in calling attention to the value of cystoscopy. Much valuable information is to be obtained only in this way; it is no longer justifiable to operate on the kidney, without previous ureteral catheterization. A few cases of hæmaturia seem to improve after catheterization, whether this may be due to the catheter breaking off a small papilloma, thereby stopping the bleeding temporarily at least, is a question. He has seen prolonged hæmaturia of a mild grade follow catheterization without apparent bad results.

DR. FOWLER thought the danger of cystoscopy and ureteral catheterization greatly overestimated; it is unfortunate that the attitude of many surgeons remains antagonistic to this simple and useful procedure. The accidental ligation of a ureter can be demonstrated by the catheter, often; foreign bodies may be removed from the bladder; ureteral stone diagnosed; the applications of cystoscopy are many and the dangers practically none; he does not hesitate to perform it as a routine office procedure.

DR. ABBE mentioned a case where hæmorrhage lasting 24 hours, with considerable pain, followed ureteral catheterization. Such a case would make him hesitate to advise it lightly or to do it in an office. He thinks cystoscopy in the female probably best done by a gynecologist rather than by a urologist doing only male work, as the gynecologist's knowledge of the uterus and adnexa would give a more complete opinion.

DR. CARR said that "sounding," even of the urethra, is not necessarily simple; it depends on who does it, and how it is done. With the present technique ureteral catheterization is probably not dangerous. At any rate, the ureteral catheter will not make the false passages produced by improperly used urethral sounds. It may not be necessary for every gynecologist to use the ureteral catheter though probably all should be able to use the cystoscope.

DR. MILLER, in closing, said he had not attempted to take up all possible uses for cystoscopy. He does not think that with ordinary care in the ordinary case, any serious harm will follow ureteral catheterization. He predicts that the gynecologist and obstetrician of the future will do cystoscopy generally.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

FREDERIC A. BESLEY, M. D.

GEORGE E. BEILBY, M. D. — WM. R. CUBBINS, M. D. — AIMÉ PAUL HEINECK, M. D.
J. S. EISENSTAEDT, M. D. — FREDERICK G. DYAS, M. D. — G. T. COURTENAY, M. D.
JOHN A. WOLFER, M. D. — JAMES F. CHURCHILL, M. D. — H. A. POTTS, M. D.

Experiences in Thoracic Surgery Under Anæsthesia by the Intratracheal Insufflation of Air and Ether. CHARLES A. ELSBERG. *Annals of Surgery*, vol. liv, p. 749, December, 1911.

About two years ago Meltzer and Auer first described the method of artificial respiration by the intratracheal insufflation of air. In later publications they showed that in animals the method was of great value for experimental investigations in which one or both pleural cavities had to be opened. At the same time, Elsberg had been making a large number of investigations on dogs, and with the aid of Dr. Neuhof had performed a not inconsiderable number of operations upon the lungs, bronchi, and the œsophagus in these animals. Thus he removed one or several lobes of one or both lungs, made incisions into bronchi with subsequent suture, etc. In all of these operations the method of intratracheal insufflation worked admirably. One or both pleural cavities could be widely opened, and all the necessary intrathoracic manipulations performed and the animals remain in good condition throughout the operations. After the thoracic wall had been closed by suture and the intratracheal insufflation stopped and the intratracheal tube removed, the animals began to breathe again in a perfectly normal manner. Unless death occurred from sepsis or followed from an unsuccessful operative procedure, the animals recovered entirely. When the dogs were killed days, weeks, or months after the operations, the larynx, trachea, and lungs were found in perfectly normal condition.

As the author has described in previous papers, the insufflation was carried on by means of a very simple apparatus which had been devised by Meltzer and Auer, and no care was taken to filter, warm, or moisten the air which was blown into the trachea. Nevertheless, no lesion could be found at postmortem in the respiratory tract of these dogs. The anæsthesia was a very good one and seemed to be absolutely devoid of danger. It is well known that it is easy to kill a dog by means of ether given by inhalation, but we have found it impossible to kill the animals with ether given by intratracheal insufflation. This safety is probably due to the fact that so much of the ether escapes upward in the trachea and out through the larynx and mouth.

The author gives an account of his experiences with the method for intratracheal insufflation in man and reports upon the cases of intrathoracic surgery which he has had up to the present time.

At the Mt. Sinai Hospital, New York, the author has anæsthetized about 200 patients by means intratracheal insufflation and has found the method very valuable for a great many operations. In all but a few cases, he found the anæsthesia very satisfactory and particularly free from complications and after-effects. It was used in a great variety of acute and chronic surgical diseases. He found it most useful in operations upon the neck, more especially those around the trachea, such as thyroidectomy, for the anæsthetizer is never near the field of operation and the operator can work around the trachea without causing any interference with the breathing. There is no danger of sudden collapse of the trachea when a large goitre has been removed, and, no matter how much the trachea has been handled, the anæsthesia continues smoothly and evenly. He likewise found the method useful in operations upon the face and jaw and within the mouth. In thoracic surgery it constitutes a positive pressure method which on account of its simplicity the author believes may take the place of the more complicated positive and negative cabinets.

He reports in detail nine cases for greatly varying conditions. He states that, while the cases are too few in number to allow one to draw final conclusions, they do indicate that in the method of intratracheal insufflation we have a simple method for the avoidance of those dangers which have prevented the development of surgery of the intrathoracic viscera. GEORGE E. BEILBY.

The Technique and Report of Epilepsy Operations. DR. DOBERER. *Wien. klin. Woch.*, 1912, XXV, 370.

This consists of a report of five cases of epilepsy treated by the following method: The soft parts are laid back and a five-cornered piece of bone removed. The dura is then divided in opposite directions for flaps, which are turned back. The bone is then replaced and the skin sutured over. The author reports excellent results from this method. The advantage is that there are no ligatures and no sutures which remain behind in the skull cavity.

The Distinguishing Marks between Gastric Ulcer and Gastric Carcinoma in the X-Ray Picture (Die unterscheidenden Merkmale zwischen Magengeschwür und Magenkrebs im Röntgenbilde). MARTIN HAUDELS. *Wien. klin. Wochnschr.*, 1912, XXV, 67.

The writer comes to the following conclusions:

1. The X-ray differential diagnosis between ulcer and carcinoma rests on the recognition of the typical pictures of these two diseases, which show essentially different marks corresponding to the various pathological-anatomical pictures.

2. The test of the motor gastric functions shows the principle differences in ulcer and carcinoma, which in many cases makes the differential diagnosis easier.

3. This is with the help of recognized factors in the majority of cases possible and becomes easy because with the finding of a change usually the character of this is shown. An exception to this is found in slight degrees of pyloric stenosis in both diseases.

4. Malignant degeneration of an ulcer cannot be diagnosed by the X-ray. A slight possibility of doing this exists where the ulcer is located far from the pylorus. But where the location is at the pylorus the change is not to be recognized.

A Case of Gunshot Wound of the Thoracic Portion of the Esophagus (Ein Fall von Schussverletzung des Oesophagus im Brustteile). JULIUS HOCHENEGG. *Wien. klin. Wochenschr.*, 1912, XXV, 36.

This occurred in a girl 19 years of age who attempted to commit suicide by shooting herself in the left side of the thorax. The bullet entered the fifth intercostal space four fingers breadth to the left of the sternal border. The X-ray showed the bullet in the left side of the thorax behind the eighth rib, three fingers breadth outside of the vertebral column. Immediately after the operation the girl was unconscious. On examination the chest showed no signs of pneumo-thorax or hemo-thorax. The abdomen was very much distended and the patient had vomited decomposed blood (coffee ground vomit). Exploratory laparotomy failed to reveal any abdominal wound. The patient made an uneventful recovery. Hochenegg thinks that there was a wound of the esophagus and at the same time certain branches of the vagus nerve which supplies the stomach were divided, giving rise to paralysis of the stomach wall and consequent distention.

The Action of Tryptic Ferment Solution on Local Surgical Tuberculosis and Anti-Ferment Treatment of Purulent Processes (Über die Wirkung von tryptischen Fermentlösungen auf örtliche chirurgische Tuberkulose und über die Antifermentbehandlung eitrige Prozesse). M. SAIDMAN. *Wien. klin. Wchnschr.*, 1912, XXV, 204.

This work was undertaken because of the fact that the cold tuberculous abscess is leucocyte—and ferment — poor and the lymphocytes have no proteolytic action. For this purpose a 1 per cent sterile physiological salt solution of trypsin was used. Injection was made into glands and cold abscesses. The conclusion is that its therapeutic effect was greater than that of iodoform glycerine.

The Anterior Heel. A further contribution to the question of balance. ANSELL G. COOK. *Am. Jour. Orth. Surg.*, August, 1911.

In this article the author continues his studies of the mechanics of the foot and the question of balance, on which topic he has contributed papers before the American Orthopedic Association for several years. By means of a very ingenious mechanical arrangement, consisting of a base, a movable upright and a suspended weight, he demonstrates the effect upon the joints and tissues and arches of the foot of a change in the location of the center of gravity. The chief object of this demonstration is to serve as a basis for the argument in favor of the "anterior heel." This is an inverted, triangular-shaped piece of leather extending obliquely across the ball of the shoe just behind the heads of the metatarsal bones, the object being to "support the heads, equalize the pressure and support the anterior arch."

The author states that the use of the anterior heel "affords instantaneous and efficient relief from all troubles of the anterior part of the foot, such as depression of the anterior arch, callosities, corns, bunions, twisted or distorted toes, Morton's toe, anterior metatarsalgia, etc., etc."

"The common cause of all these troubles is undue pressure and the anterior heel, by removing this pressure, removes the cause, and places the injured parts in a position where recovery is possible."

J. L. PORTER.

BOOK REVIEWS

THE PARASITIC AMŒBÆ OF MAN. By Charles F. Craig, M. D. Philadelphia: J. B. Lippincott & Co., 1912.

It is with pleasure that one notes the growing tendency among medical writers toward the production of mongraphs as opposed to the compiling of larger volumes covering several subjects. A monograph must needs be the work of a man who has himself made a long and thorough study of a special field of work, so that it is made up of the results of personal investigation as well as a summary and discussion of the work and opinions of former investigators.

Such a study is the one at hand. Captain Craig's work on Amœbae is probably known to most medical readers through his various shorter communications of the past ten years. It is based on his work done in the medical corps in this country and in the Philippines and as a member of the U. S. Army Board for the Study of Tropical Diseases.

A detailed review of the volume is impossible in this place. It is sufficient to say that laboratory workers, public health officers and others interested will find it an authoritative and exhaustive consideration of the subject of the parasitic amœbae.

J. F. C.

GYNECOLOGY. The Practical Medicine Series, Vol. IV. Edited by Emilius C. Dudley, M. D. Chicago: The Year Book Publishers, 1911.

Upon the very first page the author presents an excellent excerpt of Tuttle's valuable article on the relation between rectal diseases and diseases of the female pelvic organs. Then follows a detailed description of Marshall's suture of the abdominal wall and his technique in laparotomy. Important seem the articles on non-tuberculous pyosalpinx in virgins and the advice is given to operate upon patients with acute gonorrheal salpingitis. It is suggested that Dudley's combined use of tents and intrauterine medication has not been tried long enough to recommend it for general practice, and bearing out this opinion, follows DeBovis' article on salpingitis after the use of tents.

The extensive abstract of Kerr's article on the importance of removing the uterus in certain diseased conditions of the adnexa and the warning for over-conservatism in gynecology is well written. The chapters devoted to cancer of the uterus, its early diagnosis, signs and cure are well written and illustrated and contain the foremost papers on the subject in a condensed but very comprehensive form. Considerable space is given the chapter on fibroid of the uterus, its frequency, dangers, degeneration, its relation to pregnancy, and its treatment. Not giving much hope but rather placing grave suspicion upon the reported good results of the effect of X-rays upon myomata, the author gives this most modern addition to the gynecological armamentarium a lengthy discussion.

The important part of the etiological relationship between ptoses and neurasthenia is treated at considerable length, as is the operation for retrodisplacement of the uterus. The description is accompanied by very good illustrations.

The chapter on the disorders of menstruation and on sterility are as comprehensively dealt with as in the best text-books.

As a whole the book can be highly recommended for the use of the general practitioner and is an excellent reference book for the library.

HELIODOR SCHILLER.

DISEASES OF THE GENITO-URINARY ORGANS, (Considered from a Medical and Surgical Standpoint, Including a Description of Gonorrhea in the Female and Conditions Peculiar to the Female Urinary Organs.) By Edward L. Keyes, Jr., M. D., Ph. D. New York and London: D. Appleton and Company, 1912.

It is the author's aim in this well-bound and well-written volume of nine hundred and seventy-five pages to teach the student and practitioner just how far his knowledge of diagnosis and treatment should carry him in this special field, and how much he must depend upon the well-trained urologist.

The author has discarded the usual anatomical arrangement of subject matter for what might be termed the "Principles of Urology" leading up to gonorrhea and prostatism, the great causes of urinary inflammation.

The first six chapters are devoted to the "Principles" comprising physical examination, urinalysis, urethral instruments and their asepsis, passage of urethral instruments, cystoscopy, and estimation of renal function. Then follow chapters on inflammation, stone, tubercle and hydronephrosis as well as chapters on minor topics such as neoplasms, injuries, anomalies etc. Lastly is a section devoted to operative surgery.

This arrangement avoids needless repetition, the texts proper are in heavy type upon dull paper. The book is thoroughly up to date including what is known of vaccines and serum therapy, X-rays in treatment and their use in diagnosis, salvarsau, etc.

H. A. POTTS.

CLINICAL CONGRESS OF SURGEONS OF NORTH AMERICA

Third Annual Session to be held in New York City, November 11 to 16, 1912

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JOHN G. CLARK, M. D., Vice-President — GEORGE E. BREWER, M. D., Vice-President-Elect
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THE THIRD CLINICAL CONGRESS

THOSE interested in the meeting of the Clinical Congress of Surgeons of North America, to be held in New York City, November 11th to 16th, will read with pleasure the following pages in which are presented an amplified clinical program, the first outline of the literary scientific program and the second article of the series on New York as a Surgical Center, "The Medical Societies of New York City," by Floyd M. Crandall, M. D.

The clinical program as a whole has been materially increased, and in this issue the first announcement is made of the laboratory demonstrations and the clinics in orthopedic surgery.

The first outline of the literary program is of necessity far from complete. A number of

prominent European surgeons, who have been selected to participate, have been unable to give positive promises at this early date, and those who have been selected to open the discussions on the papers in the various symposia have not as yet been definitely assigned.

It is the purpose, in the completed program, to cover the most important topics in the various surgical specialties, by assigning surgeons throughout the world who are identified in the minds of practitioners as authorities on these topics, to present communications at the evening meetings, and to appoint prominent New York surgeons to open the discussions on the various subjects.

The evening meetings will be six in number, one each on Monday, Tuesday, Wednesday and Friday, and two on Thursday. One of the meetings on Thursday evening will be devoted to the surgery of Ophthalmology, Otology and Laryngology. Four of the evening meetings will be held in the Grand Ballroom of the Waldorf-Astoria, and one in Brooklyn under the auspices of the Kings County Medical Society.

NEW YORK AS A SURGICAL CENTER

Article II—The Medical Societies of New York City

By FLOYD M. CRANDALL, M. D., New York City
Recent President of the Medical Society of the County of New York, the Society of the Alumni of Bellevue Hospital, and the West End Medical Society

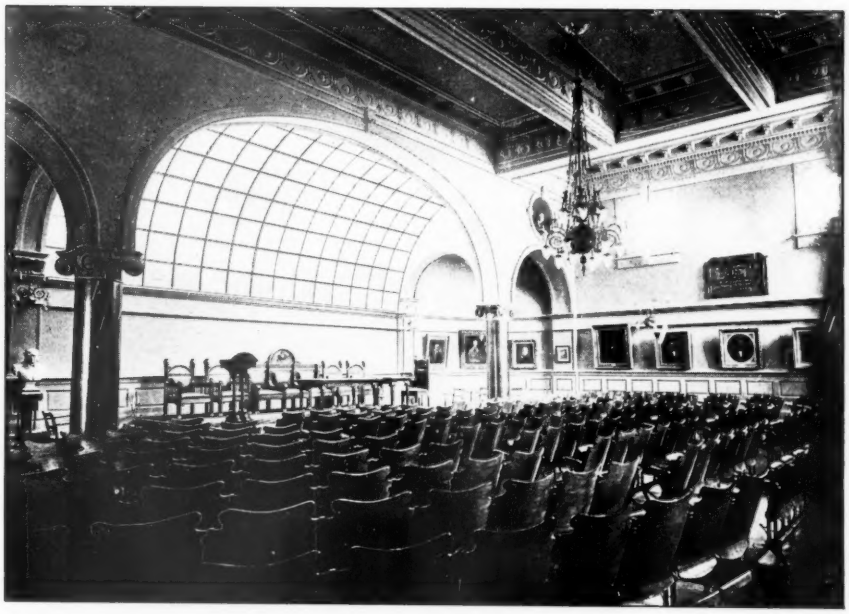
MEDICAL societies have been likened by Osler to professional cement that binds professional men together. Certain it is that they are the most potent of all agencies in bringing medical men in touch with each other, in fostering fraternal relations, and in building up the structure known as the medical profession. No town could aspire to position as a medical center without ample and efficient medical societies. In the case of New York, there is certainly no dearth of such organizations. In fact, the multiplying of medical societies has been carried to an injudicious extreme. In the greater city, there are at least 132 medical societies of all types. Of these, 2 are Eclectic, 18 Homeopathic, and 112 non-sectarian; 104 are in New York County, which consists of the boroughs of Manhattan and the Bronx (the original City of New York). There are 7,249 registered physicians in the greater city. It is impossible to classify these societies with accuracy, for some are complex in their aims and membership. I have, however, gathered them into groups for consideration in the following pages.

A study of the history of these societies shows that on the whole they have been logical developments and reflect quite clearly the development of medical science and the growth of the city. As professional and local conditions have changed, societies have been formed to meet the new requirements. It is from this point of view that I will consider the subject in this brief paper.

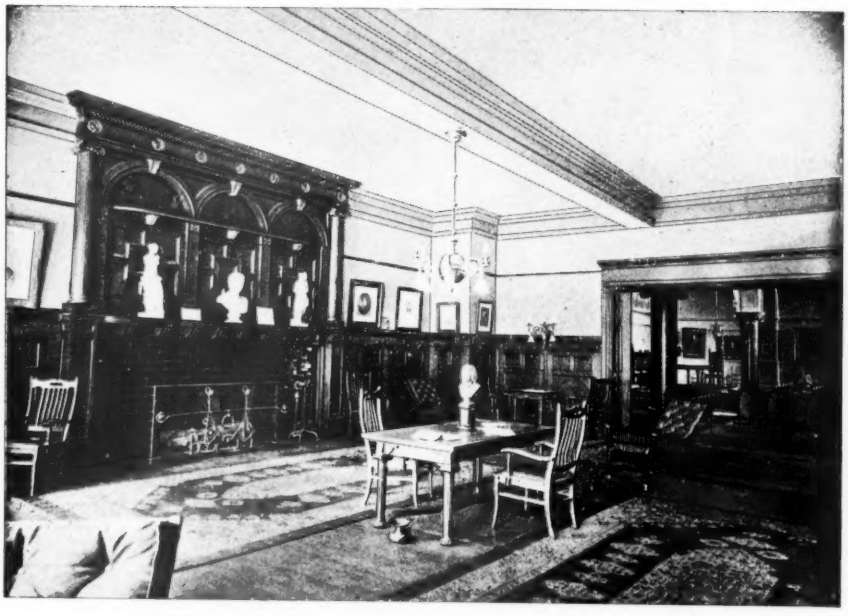
The first society to be considered, therefore, is the Medical Society of the County of New York, which held its first meeting on November 14, 1794. In 1806 the law was enacted which looms up as a landmark in the medical history of the state. Its most important feature was the provision made for the organizing of county medical societies. They were declared to be "bodies corporate and politic," and were made an integral part of the state government. Not only were unusual powers conferred upon them but the responsibility was placed upon them "of regulating the practice of physic and surgery in this state." In few other states, if in any, have the county societies so much power and so much responsibility. Under this law the old society was reorganized and held its first meeting as a corporate body in July, 1806, with a membership of 371.

The functions of the New York County Society may be divided into six groups. Three of these (the scientific, social, and disciplinary) have to do with its own membership. Three (hygienic, legislative, and legal) have to do with the public and profession at large. The social session, with a collation, which follows the scientific session

New York Academy of Medicine.



Hosack Hall, New York Academy of Medicine.



Reception Room, New York Academy of Medicine.

A corner of the Library, New York Academy of Medicine.

at the regular monthly meetings, is a feature of great value in bringing physicians from widely scattered parts of the city into personal acquaintance. Through its board of censors, the County Society is the chief disciplinary agency of the profession of the city. The society is also a great unifying force. Among its 2,463 members are all sorts and conditions of doctors. No other society reaches out and takes within its fold such a variety of physicians and in such numbers.

In addition to numerous activities in the direction of public health and hygiene, the New York County Society has for years maintained a milk commission, one of the first in the country. Its legislative work is very important and is done through a special committee, which acts subordinate to a similar committee of the State Society. The legislative work is both constructive and defensive. The importance of the latter feature may be realized when it is known that as many as 379 bills having a more or less direct medical bearing, have been introduced in a single session at Albany. Were half the bills of a single legislative session to be passed, the medical practice laws would be left in tatters.

Perhaps the most distinctive and important part of the work of the New York County Medical Society is its legal work. It has, I believe, been more extensive and effective than that of any other society in the country. It is one of an

important group of societies to which is entrusted the work of enforcing certain provisions of the criminal law. The Society for the Prevention of Cruelty to Children is a well known organization of this character. The specialist becomes an expert, and these societies become very skillful in ferreting out certain forms of crime and bringing certain classes of criminals to justice. The legal work has not only increased steadily during the past fifteen years, but there has been a steady evolution of principles and methods. Illegal and criminal practitioners are now easily convicted, whom no one would have dared to attack a decade ago.

Eternal vigilance and ceaseless activity are necessary to maintain the present legal standards of medical education and practice. The medical profession of a great city requires an alert, experienced, and ever ready defender. It needs at all times a trained business agent, whose vocation it shall be to take the lead in matters affecting the public health and in questions pertaining to the profession as a whole. A hundred years ago this important duty was assigned by the State of New York to the state and county societies and they have borne it to this day. Under the system of organization adopted in 1905, members of the county societies become automatically members of the State Society. The State Society assumed three important functions, by which the members of the county societies are beneficiaries. The first of these is the publication of a medical journal of high character, the second the annual publication of a directory. A directory is an absolute essential in a state containing so many large cities. It was formally published by the New York County Society, but was taken over by the State Society as being better capable of performing such a work.

The third function assumed for the county societies is medical defense. A few years ago it was known to be a fact that one physician in every 150 was sued for malpractice, and 97 per cent of such cases were brought for blackmail purely. If stoutly defended they are abandoned. Persistant resistance to such cases by a strong state organization certainly reduces their number. There is a small percentage of cases in which there are legal questions to be decided by a court or facts to be determined by a jury. In such cases the accused member receives proper legal advice and his rights as a citizen are safeguarded. It should be understood that physician's defense was not instituted to defend those who commit illegal acts. It is right that medical men should stand together and defend one another in case of attack. This, members of the County Societies are now doing in New York, using the State Society as their agent.

Thus far in this paper the Medical Society of the County of New York has been used as a type, as being the oldest and largest. The remaining counties of the greater city (Kings, Queens, Richmond, and Nassau) each have active societies working along the lines already described. The Kings County Society, founded in 1822, is a vigorous organization of 851 members. It has constructed a handsome building at an expense of voer $100,000.00 which constitutes the medical center of Brooklyn. Through an organization consisting of its own members it maintains a large medical library. It also does considerable legal work.

In 1833 the desirability of a small private medical society was felt by certain physicians and resulted in the formation of the Medical and Surgical Society. As yet there were no specialities in the modern sense and the society included all practitioners. It is still in existence and 29 other private medical societies and clubs are holding regular meetings. They are mostly of limited membership and meet at the homes of members. Their objects are social and scientific; they are not limited to a speciality nor restricted by locality. Of the thirty medical clubs and private societies, eleven are Homeopathic, the practitioners of that school having a special fondness for small clubs of this type.

The New York Academy of medicine was founded in 1847 and incorporated in 1851. Its membership is limited to 1200 active fellows, and physicians are eligible three years after graduation. It has many reasons for being, but in three respects its work is so characteristic as to merit notice. The first of these is its scientific work, which is peculiar to itself among the medical societies of the city. It is divided into nine sections, each devoted to a branch of medical practice. Each section meets monthly and is presided over by its own chairman, while the Academy holds two meetings monthly, presided over by the president. These sections are of the greatest practical value to the profession of the city. They are not alone training schools for specialists, but are largely attended by general practitioners. It has been suggested that it would be better were the special societies incorporated with their respective sections in the Academy. There is something to commend such a plan, but the present system has many points in its favor. The special societies are mostly

limited in membership and meet at the homes of the members. They admit only recognized specialists. The Academy admits physicians after three years of practice and each member may select a section. The section is a place, therefore, where the young man may meet others of his chosen speciality, and may hear discussions of particular interest to him. He may take part in the meetings and be in training long before he is eligible to membership in any special society. Admission to a special society in later years is an honor worthy of a hard apprenticeship, and puts the stamp of authenticity upon a specialist. Many general practitioners do considerable work in some special direction without attempting to become strict specialists. To such the sections of the Adacemy are very helpful.

The second important feature of the Academy's work is the Academy building. This handsome structure shelters many professional organizations, and is the medical centre of Manhattan. The third and perhaps most important feature of the Academy's work is the maintaince of a medical library. It is unnecessary to address medical men upon the importance of a large and well equipped public medical library. It is the very breath of life, not alone to the professional writer and author but to the practitioner as well. This difficult task is performed by the Academy of Medicine. Its library now numbers 89,628 volumes, not including duplicates.

In the large size of their membership and the wide area from which it is drawn and in their peculiar and varied functions, the Academy and the County Societies differ from other medical societies and form a class by themselves. They divide between them functions which in some cities are fulfilled by a single body. These functions consist in the performance of certain duties to the public and to the medical profession as a whole. It is in this that they differ radically from other societies whose interests are centered in the *individual*. In these two societies interest is bestowed also upon the *profession*. The division of function between them has been made with a skill that commands the admiration of everyone brought into intimate knowledge of their intricate workings. They work side by side in perfect harmony, the membership of one being almost wholly included in that of the other, while the same names are frequently found on the official boards of each.

The development of sectarian medicine was followed by the organization of the State Homeopathic Mecidal Society in 1850 and the County Society in 1857, which now has a membership of 369. The State and County Eclectic Societies were organized in 1865. The latter now has a membership of 112.

As medical science expanded, specialism began to develop and we may trace its course by the formation of a series of special societies. Of these the Neurological and Obstetrical are prominent examples. Most of them are limited in membership and meet at the homes of the members. There are now at least twenty-six societies of this type in the city, six of them being in Brooklyn. Several of the more recent of these special societies are devoted to pure medical science, the Society of Experimental Biology being an example. Thus we again see the expansion of medicine reflected by the societies.

As the tide of immigration began to arise in the middle of the last century, large numbers of physicians of foreign birth or parentage entered upon practice in New York. This fact is reflected in the medical societies, for we find a group based upon nationality. It is not unnatural that practitioners of foreign birth or descent should seek the society of those of the same lineage, particularly if they speak a language other than English. This tendency is wholly commendable, provided only that physicians do not limit themselves strictly to membership in such organizations. Such limitation begets a blind following of foreign authorities without reference to the manifestations of disease which appear in this country or the peculiar physical and mental types which America produces. This tendency is apparently slight in New York, where physicians of foreign lineage are among the most active in general society work.

The city's growth is clearly reflected in the growth of medical societies. In earlier times the city was small and homogeneous and a few general societies were ample. As the city has expanded to near the 5,000,000 mark, it has developed into localities and neighborhoods so different in character that the one knows not the other. As a natural result, therefore, local medical societies have grown up and now number at least sixteen in the greater city, of which the Harlem Medical Association, the East Side Physicians Association, and the West End Medical Society are examples. These societies vary in character from semi-public bodies of several hundred members to private clubs which meet in the homes of the members. They do scientific and social work, but their distinctive reason for being is to bring together physicians of special localities.

The local societies have much to commend

them. They are a logical development and fill an actual need. They offer opportunities for the presentation of papers and participation in discussion which the larger societies cannot give in their more formal meetings. Many men take part in the meetings of their local society who would otherwise never be heard, either because of diffidence or lack of opportunity. They bring the practitioners of a neighborhood together and foster a spirit of friendship between neighboring physicians that is productive of great good. Here the doctor comes in contact with other doctors of the same part of the city and meets intimately those who are living under the same conditions, treating the same class of patients, and encountering the same obstacles. These local societies take a firm hold upon the regard of their members.

The remarkable hospital growth of the past three decades has been followed by the development of another type of medical society, namely, the hospital alumni society. The first of these to be formed in New York was the Society of the Alumni of Bellevue Hospital, in 1886. The primary object of these societies is to perpetuate the friendships formed in early professional life between those who have worked side by side as internes in the hospitals. They seek also to encourage professional work and study. There are now at least twenty-seven such societies, ranging in numbers from a few dozen to the 340 of Bellevue. There are also five alumni societies of medical colleges.

The formation of the so-called greater city of New York was soon followed by the organization of the Greater New York Medical Association "to bring together the members of the profession of medicine residing in the various boroughs." The New York Academy of Medicine, it should be understood, also receives members from every part of the city without discrimination as to borough, and is a potent unifying force.

Another type of rather recent date includes the clinical societies of medical colleges. Of these there are at least six. They are designed to bring the younger members of the faculty into touch with the older and more important members and to arouse enthusiasm. They aid in bringing about greater unify of action and stimulate in the teaching body a spirit of loyalty to the college and interest in its success.

Two benevolent societies stand in a group by themselves, namely, the Physicians' Mutual Aid Association and the Society for the Relief of Widows and Orphans of Medical Men. Their sole object is to furnish pecuniary aid to their members in case of urgent need or to their families in case of death. They are worthy of all commendation and are well supported by the profession.

There are still a number of societies which cannot well be classified, as the Medico-Legal Society, the Medical Library Association of Brooklyn, and the Harvey Society. The latter is one of the most recent but one of the most excellent societies of the city. Its object is "diffusion of knowledge of medical science." Its methods are unique and consist in presenting weekly lectures during the winter upon the most recent medical developments by men of the highest professional attainment. The lectures are then collected into a volume of high merit.

Some of the societies now existent in New York might well be dispensed with, but each group has its reason for being and does a necessary work. They convert a body of more than seven thousand physicians into an efficient army, which otherwise would be little better than a mob.

PRELIMINARY PROGRAM FOR EVENING MEETINGS

Monday, November 11th

Presidential Meeting—Ball-room of the Waldorf-Astoria.

ALBERT J. OCHSNER, Chicago: Address of the retiring President.

EDWARD MARTIN, Philadelphia (President's address): Treatment of Hepatic Cirrhosis.

WILLIAM J. MAYO, Rochester, Minnesota: Surgery of the Large Bowel.

Tuesday, November 12th

Ball-room of the Waldorf-Astoria.

GEORGE W. CRILE, Cleveland: Kinetic Theory of Certain Diseases, with Special Reference to Internal Secretions.

HOWARD A. KELLY, Baltimore: Paper on Kidney Surgery.

OTFRIED FOERSTER, Breslau, Germany: Indications and Results of Excision of the Posterior Spinal Nerve Roots in Man.

CHARLES H. FRAZIER, Philadelphia: Paper on Surgery of the Spinal Cord.

Wednesday, November 13th

Symposium: Cancer of the Uterus—Ball-room of the Waldorf-Astoria.

THOMAS S. CULLEN, Baltimore: Radical Operation for Cancer of the Uterus, Viewed from the Standpoint: (a) Permanent Cure; (b) Temporary Relief.

ERNST WERTHEIM, Vienna, Austria: Subject to be announced.

X. O. WERDER, Pittsburgh: The Cautery in the Radical Treatment of Cancer of the Cervix.

ROBERT L. DICKINSON, Brooklyn: Subject to be announced.

Thursday, November 14th

Symposium: Enteroptosis—Under the auspices of the Kings County Medical Society, Brooklyn.

W. ARBUTHNOT LANE, London, England: Chronic Intestinal Stasis.

JOHN G. CLARK, Philadelphia: Summary of Results in Gastro-intestinal Stasis.

ROBERT C. COFFEY, Portland, Ore.: Subject to be announced.

RICHARD R. SMITH, Grand Rapids, Mich.: Subject to be announced.

Surgery of the Eye, Ear, Nose and Throat—Astor Gallery of the Waldorf-Astoria.

CHEVALIER JACKSON, Pittsburgh: Bronchoscopy, Œsophagoscopy and Gastroscopy (Lantern Demonstration).

MYLES STANDISH, Boston: Paper on Surgery of the Eye.

EWING W. DAY, Pittsburgh: Otitic Meningitis, the Indications of and the Operative Treatment for.

Friday, November 15th

Ball-room of the Waldorf-Astoria.

E. G. ABBOTT, Portland, Maine: The Treatment of Lateral Curvature of the Spine.
Discussion by JOHN RIDLON of Chicago and ROYAL WHITMAN of New York City.

JOHN B. MURPHY, Chicago: On Surgery of the Bones and Joints.

LUDWIG PICK, Berlin, Germany: Subject to be announced.

SURGICAL CLINICS

New York City and Brooklyn

Monday, November 11th

L. V. HOTCHKISS — Bellevue Hospital — 9. Operations for hæmorrhoids and fistulæ.
JOHN A. HARTWELL — Bellevue Hospital — 9.
A. E. ISAACS — Beth Israel Hospital — morning.
H. M. SILVER — Beth Israel Hospital — 2 to 4.
W. C. WOOD — Brooklyn Hospital — 10 to 12.
J. E. JENNINGS — Brooklyn Hospital — 2 to 4.
A. H. BOGART — Coney Island Hospital — 2 to 4.
J. J. HIGGINS — Fordham Hospital — 10.
WILLIAM P. HEALY — Fordham Hospital — 2.
O. G. T. KILIANI and HERMANN FISCHER — German Hospital — 9.
FRANZ TOREK and G. H. SEMKEN — German Hospital — 2.
R. S. FOWLER — German Hospital (Brooklyn) — 10 to 1.
W. H. LUCKETT — Harlem Hospital — 1:30.
F. W. MURRAY and staff—Hudson Street Hospital—2:30.
W. LINDER — Jewish Hospital (Brooklyn) — 9 to 12.
W. L. DUFFIELD — Jewish Hospital (Brooklyn) — 2 to 4.
PARKER SYMS and staff — Lebanon Hospital — 10 and 2.
J. C. RUSHMORE — Long Island Hospital — 9 to 12.
J. B. BOGART — Methodist Episcopal Hospital — 9 to 11.
W. A. SHERWOOD — Methodist Episcopal Hospital — 11 to 1.
G. S. HARRINGTON — Metropolitan Hospital — 2.
B. D. HARRINGTON — Midwood Hospital — 9 to 12.
A. B. JOHNSON and W. A. DOWNES — New York Hospital — 2:30.
H. B. DELATOUR — Norwegian Hospital — 9 to 11.
L. S. PILCHER and P. M. PILCHER — Pilcher Private Hospital — 9 to 12.
WILLY MEYER — Post Graduate Hospital — 10.
SAMUEL LLOYD — Post Graduate Hospital — 2.
S. G. GANT — Post Graduate Hospital — 3:30.
O. S. RITCH — Prospect Heights Hospital — 3 to 5.
KARL CONNELL — Roosevelt Hospital — 9.
GEORGE E. BREWER — Roosevelt Hospital — 2.
JOHN ROGERS — St. Francis' Hospital — 2:30 to 5.
J. D. SULLIVAN — St. Mary's Hospital (Brooklyn) — 10 to 1.
W. L. CHAPMAN — Swedish Hospital — 10 to 12.

Tuesday, November 12th

JOHN ROGERS — Bellevue Hospital — 9. Operations upon the thyroids.
L. V. HOTCHKISS — Bellevue Hospital — 2. Operations on stomach and gall bladder.
E. H. FISKE — Coney Island Hospital — 2 to 4.
R. F. WALMSLEY — Cumberland St. Hospital — 1 to 3.
S. W. PALLISTER — Cumberland St. Hospital — 3 to 5.
W. H. BISHOP — Flower Hospital — 2.
A. S. TAYLOR — Fordham Hospital — 10.
ALEXANDER NICOLL — Fordham Hospital — 2.
EUGENE POOL and PERCY TURNURE — French Hospital — 2.
J. P. WARBASSE — German Hospital (Brooklyn) — 10 to 1.
WILLY MEYER and M. REHLING — German Hospital — 4. Thoracic surgery.
I. S. HAYNES — Harlem Hospital — 2:15.
J. DOWNEY — Holy Family Hospital — 2 to 4.
A. T. BRISTOW — Kings County Hospital — 10 to 12
T. B. SPENCE — Methodist Episcopal Hospital — 9 to 11.
W. F. CAMPBELL — Methodist Episcopal Hospital — 11 to 1.
R. S. FOWLER — Methodist Episcopal Hospital — 2 to 4.
A. A. BERG — Mt. Sinai Hospital — 9.
M. WARE — Mt. Sinai Hospital — 9.
A. G. GERSTER — Mt. Sinai Hospital — 2.
FRANK HARTLEY and staff — New York Hospital — 9:30.
E. D. FERRIS — Norwegian Hospital — 10 to 12.
SAMUEL LLOYD — Post Graduate Hospital — 10.
WILLY MEYER — Post Graduate Hospital — 2.
J. F. ERDMANN — Post Graduate Hospital — 3:30.
W. B. DE GARMO — Post Graduate Hospital — 4:30. Hernia clinic.
CHARLES H. PECK — Roosevelt Hospital — 9.
GEORGE E. BREWER — Roosevelt Hospital — 2.
E. J. McENTEE — St. Catherine's Hospital — 9 to 12.
W. A. DOWNES — St. Francis' Hospital — 2:30 to 5.
W. S. SIMMONS — St. John's Hospital — 10 to 12.
J. C. KENNEDY — St. Mary's Hospital (Brooklyn) — 9 to 12.
CHARLES N. DOWD — St. Mary's Hospital — 2:30.
R. J. MORRISON — Williamsburgh Hospital — 9 to 12.
M. L. BODKIN — Williamsburgh Hospital — 2 to 4.

Wednesday, November 13th

JOHN B. WALKER — Bellevue Hospital — 9. Operations for fracture of femur.
C. GOODMAN — Beth Israel Hospital — morning.
H. M. SILVER — Beth Israel Hospital — 2 to 4.
R. W. WESTBROOK — Brooklyn Hospital — 10 to 12.
ROBERT DAWBARN, E. M. FOOTE and H. D. COLLINS — City Hospital — 2 to 6.
J. P. MURPHY — Coney Island Hospital — 2 to 4.
J. J. HIGGINS — Fordham Hospital — 10.
WILLIAM P. HEALY — Fordham Hospital — 2.
W. A. DOWNES — General Memorial Hospital — 11. Radical cure of direct inguinal hernia.
CHARLES N. DOWD — General Memorial Hospital — 2:30.
WILLY MEYER and M. REHLING — German Hospital — 9.
F. KAMMERER and DE WITT STETTEN — German Hospital — 2.
W. H. LUCKETT — Harlem Hospital — 1.30.
E. H. FISKE — Holy Family Hospital — 2 to 4.
F. W. MURRAY and staff — Hudson Street Hospital — 2:30.
W. LINDER — Jewish Hospital (Brooklyn) — 9 to 12.
W. L. DUFFIELD — Jewish Hospital (Brooklyn) — 2 to 4.
PARKER SYMS and staff — Lebanon Hospital — 10 and 2.
W. B. BRINSMADE — Long Island College Hospital — 10 to 12.

J. B. BOGART — Methodist Episcopal Hospital — 9 to 11.
C. H. GOODRICH and W. A. SHERWOOD — Methodist Episcopal Hospital — 11 to 1.
W. F. HONAN — Metropolitan Hospital — 2.
N. P. RATHBUN — Midwood Hospital — 9 to 12.
A. MOSCHCOWITZ — Mt. Sinai Hospital — 9.
RICHARD LEWISOHN — Mt. Sinai Hospital — 9.
A. B. JOHNSON and W. A. DOWNES — New York Hospital — 2:30.
L. S. PILCHER and P. M. PILCHER — Pilcher Private Hospital — 9 to 12.
J. F. ERDMANN — Post Graduate Hospital — 10.
R. T. MORRIS — Post Graduate Hospital — 2.
S. W. PALLISTER — Prospect Heights Hospital — 3 to 5.
CHARLES N. DOWD — Roosevelt Hospital — 9.
WILLIAM DARRACH — Roosevelt Hospital — 2.
JOHN ROGERS — St. Francis' Hospital — 2:30 to 5.
H. B. DELATOUR — St. John's Hospital — 9 to 12.
W. MARTIN — St. Luke's Hospital — 2 to 4.
N. W. GREEN — St. Luke's Hospital — 4 to 6.
B. T. TILTON — St. Mark's Hospital — 9.
C. R. L. PUTNAM — St. Mark's Hospital — 2.
F. S. MATHEWS — St. Mary's Hospital — 9:30.
J. R. KEVIN — St. Mary's Hospital (Brooklyn) — 9 to 12.
L. A. LYNCH — Swedish Hospital — 10 to 12.

Thursday, November 14th

JOHN B. WALKER — Bellevue Hospital — 9. Operations for femoral and inguinal hernia, and for undescended testes.
JOHN A. HARTWELL — Bellevue Hospital — 2.
J. E. JENNINGS — Brooklyn Hospital — 2 to 4.
C. E. LACK — Coney Island Hospital — 2 to 4.
O. S. RITCH — Cumberland Street Hospital — 1 to 3.
G. H. ILER — Cumberland Street Hospital — 3 to 5.
A. S. TAYLOR — Fordham Hospital — 10.
ALEXANDER NICOLL — Fordham Hospital — 2.
WILLIAM B. COLEY — General Memorial Hospital — 2:30. Results from treatment of inoperable sarcoma.
FRANZ TOREK and G. H. SEMKEN — German Hospital — 9.
O. G. T. KILIANI and HERMANN FISCHER — German Hospital — 2.
J. P. WARBASSE—German Hospital (Brooklyn)—10 to 1.
I. S. HAYNES — Harlem Hospital — 2:15.
R. SULLIVAN — Holy Family Hospital — 2 to 4.
J. B. BOGART — Kings County Hospital — 10 to 12.
B. T. TILTON — Lincoln Hospital — 8:30.
C. R. L. PUTNAM — Lincoln Hospital — 11.
SETH MILLIKEN, Jr. — Lincoln Hospital — 2.
T. B. SPENCE — Methodist Episcopal Hospital — 9 to 11.
C. H. GOODRICH and W. F. CAMPBELL — Methodist Episcopal Hospital — 11 to 1.
G. S. HARRINGTON — Metropolitan Hospital — 2.
FRANK HARTLEY and staff—New York Hospital—9:30.
H. B. DELATOUR — Norwegian Hospital — 9 to 11.
E. D. FERRIS — Norwegian Hospital — 10 to 12.
R. T. MORRIS — Post Graduate Hospital — 10.
SAMUEL LLOYD — Post Graduate Hospital — 2.
W. B. DE GARMO — Post Graduate Hospital — 3:30. Hernia clinic.
N. ROBINSON — Prospect Heights Hospital — 3 to 5.
CHARLES H. PECK — Roosevelt Hospital — 9.
FRED ALBEE — Roosevelt Hospital — 2.
P. HUGHES — St. Catherine's Hospital — 9 to 12.
A. T. BRISTOW — St. John's Hospital — 10 to 1.
E. A. PARKER — St. Mary's Hospital — 9 to 12.
E. A. PARKER — Williamsburgh Hospital — 2 to 4.

Friday, November 15th

W. A. DOWNES — Babies Hospital — 2.
L. V. HOTCHKISS — Bellevue Hospital — 9. Abdominal operations.
GEORGE WOOLSEY — Bellevue Hospital — 9. Operations on stomach and gall bladder.
W. C. WOOD — Brooklyn Hospital — 10 to 12.
J. J. HIGGINS — Fordham Hospital — 10.
WILLIAM P. HEALY — Fordham Hospital — 2.
CHARLES N. DOWD — General Memorial Hospital — 9:30.
WILLY MEYER and M. REHLING — German Hospital — 4. Thoracic surgery.
R. S. FOWLER — German Hospital (Brooklyn) — 10 to 1.
W. H. LUCKETT — Harlem Hospital — 1:30.
F. W. MURRAY and staff — Hudson Street Hospital — 2:30.
W. LINDER — Jewish Hospital (Brooklyn) — 2 to 4.
A. T. BRISTOW—Long Island College Hospital—10 to 12.
J. B. BOGART — Methodist Episcopal Hospital — 9 to 11.
W. A. SHERWOOD — Methodist Episcopal Hospital — 11 to 1.
W. F. HONAN — Metropolitan Hospital — 2.
C. DUNCAN — Midwood Hospital — 9 to 12.
C. A. ELSBERG — Mt. Sinai Hospital — 9.
W. M. BRICKNER — Mt. Sinai Hospital — 9.
H. LILIENTHAL — Mt. Sinai Hospital — 2.
L. S. PILCHER and P. M. PILCHER — Pilcher Private Hospital — 9 to 12.
J. F. ERDMANN — Post Graduate Hospital — 2.
S. G. GANT — Post Graduate Hospital — 3:30. Rectal surgery.
A. V. S. LAMBERT — Roosevelt Hospital — 9.
JAMES I. RUSSELL — Roosevelt Hospital — 2.
M. FIGUEIRA — St. Catherine's Hospital — 9 to 12.
JOHN ROGERS — St. Francis' Hospital — 2:30 to 5.
W. B. BRINSMADE — St. John's Hospital — 9 to 12.
ROBERT ABBE — St. Luke's Hospital — 2 to 4.
W. S. SCHLEY — St. Luke's Hospital — 4 to 6.
O. A. GORDON — St. Mary's Hospital (Brooklyn) — 9 to 12.
CHARLES N. DOWD — St. Mary's Hospital — 2:30.
W. S. SIMMONS — Swedish Hospital — 10 to 12.
J. G. DICKERT — Williamsburgh Hospital — 10 to 12.
GEORGE T. CHASE — J. Hood Wright Hospital — 10.

Saturday, November 16th

RICHARD LEWISON — Beth Israel Hospital — morning.
H. M. SILVER — Beth Israel Hospital — 2 to 4.
A. E. ISAACS — Beth Israel Hospital — afternoon.
R. W. WESTBROOK — Brooklyn Hospital — 10 to 12.
W. T. HELMUTH — Flower Hospital — 2.
A. S. TAYLOR — Fordham Hospital — 10.
ALEXANDER NICOLL — Fordham Hospital — 2.

F. KAMMERER and DE WITT STETTEN — German Hospital — 9.
WILLY MEYER and M. REHLING — German Hospital — 2.
I. S. HAYNES — Harlem Hospital — 2:15.
C. BARBER — Kings County Hospital — 9 to 11.
T. B. SPENCE — Methodist Episcopal Hospital — 9 to 11.
W. F. CAMPBELL — Methodist Episcopal Hospital — 11 to 1.
R. S. FOWLER — Methodist Episcopal Hospital — 2 to 4.
J. WIENER — Mt. Sinai Hospital — 9.
FRANK HARTLEY and staff — New York Hospital — 9:30.
R. T. MORRIS — Post Graduate Hospital — 2.
CHARLES H. PECK — Roosevelt Hospital — 9.
GEORGE E. BREWER — Roosevelt Hospital — 2.
W. A. DOWNES — St. Francis' Hospital — 8:30 to 12.
J. A. LEE — St. Mary's Hospital (Brooklyn) — 9 to 12.
W. F. CAMPBELL — Trinity Hospital — 2 to 5.

Days and Hours to be Announced Later

JOSEPH A. BLAKE and staff — Presbyterian Hospital — three morning clinics.
ELLSWORTH ELIOT, JR., and staff — Presbyterian Hospital — three afternoon clinics.
G. D. STEWART — Bellevue Hospital.
T. A. SMITH — Bellevue Hospital.
JOSEPH D. BRYANT — St. Vincent's Hospital.
G. D. STEWART and staff — St. Vincent's Hospital.
JOSEPH BISSELL — St. Vincent's Hospital.
J. F. ERDMANN — Gouverneur Hospital.
H. A. HAUBOLD — Harlem Hospital.
J. J. McGRATH — Harlem Hospital.
C. L. GIBSON — St. Luke's Hospital.

GYNECOLOGICAL AND OBSTETRICAL CLINICS

Monday, November 11th

J. BRETTAUER, S. M. BRICKNER and R. T. FRANK — Mount Sinai Hospital — 9 to 2. Gynecological operations.
L. J. LADINSKI — Polyclinic Hospital — 9 to 10. Gynecological operations.
ROBERT WYLIE — Polyclinic Hospital — 3 to 5. Gynecological operations.
CLEMENT CLEVELAND with E. W. PINKHAM — Woman's Hospital—9 to 11. Gynecological operations.
HERMAN GRAD and W. M. FORD — Woman's Hospital — 9 to 10. Demonstration of Hospital, Laboratories, Technique and after-care. 10 to 11 —Demonstration of postoperative results.
DOUGAL BISSELL with EVERETT M. HAWKS — Woman's Hospital — 2 to 6. Gynecological operations.
GEORGE H. MALLET — General Memorial Hospital — 2 to 6. Gynecological operations.
JAMES N. WEST — Post-Graduate Hospital — 9 to 12 Gynecological operations.
ATTENDING STAFF — Lying-In Hospital — 9 to 10. Demonstration of Hospital, Laboratories, cases, methods, etc.
JAMES A. HARRAR — Lying-In Hospital — 10 to 11. Demonstration of examination of pregnant women and pelvic measurement.
JAMES W. MARKOE and A. B. DAVIS — Lying-In Hospital — 2:30 to 3:30. Obstetrical and gynecological operations.
L. L. DANFORTH — Homeopathic Medical College and Flower Hospital — 5 to 6. Obstetrical operations.
E. P. SWIFT — Hahnemann Hospital — 5:30. Obstetrical operations.
J. CLIFTON EDGAR, or AUSTIN FLINT, JR., or C. C. BARROWS — Manhattan Maternity Hospital — 2 to 3:30. Demonstration of the management and technique of the hospital. Obstetrical operations.
W. H. RANKIN — Coney Island Hospital — 11 to 1. Gynecological operations.
S. J. McNAMARA — Kings County Hospital — 10 to 12. Gynecological operations.
H. B. DELATOUR — Norwegian Hospital — 9 to 11. Gynecological and surgical operations.
J. F. RANKEN — Prospect Heights Hospital — 10 to 12. Gynecological clinic.

Tuesday, November 12th

HOWARD C. TAYLOR with WM. P. HEALY — Roosevelt Hospital — 2:30 to 6. Gynecological operations.
L. J. LADINSKI — Beth Israel Hospital — 9. Gynecological operations.
S. W. BANDLER — Beth Israel Hospital — 2. Gynecological operations.
F. FOERSTER and F. R. OASTLER — German Hospital — 9. Gynecological operations.
G. SEELIGMANN and ARTHUR STEIN — German Hospital — 2. Gynecological operations.
RALPH WALDO and GUSTAV SEELIGMANN — Lebanon Hospital — Gynecological operations.
H. S. STEARNS and C. G. CHILD, JR. — City Hospital — 2. Gynecological operations.
F. KRUG with H. N. VINEBERG and S. WIENER — Mount Sinai Hospital — 9 to 2. Gynecological operations.
LEROY BROUN with R. M. RAWLS — Woman's Hospital — 9 to 12. Gynecological operations.
C. G. CHILD and EVERETT M. HAWKS — Woman's Hospital — 9 to 10. Demonstration of Hospital, Wards, Laboratories and Technique. 10.— Demonstration of postoperative results.
P. F. CHAMBERS with HERMAN GRAD — Woman's Hospital — 2 to 6. Gynecological operations.
JOSEPH C. TAYLOR — Polyclinic Hospital — 8 to 10. Gynecological operations.
BROOKS H. WELLS — Polyclinic Hospital — 3 to 5. Gynecological operations.
G. G. WARD, JR. — Post-Graduate Hospital — 9 to 12. Gynecological operations.
H. D. FURNISS — Post Graduate Hospital—2. Cystoscopy and ureteral catheterization.
E. G. TUTTLE — Homeopathic College Hospital and Flower Hospital—10 to 12. Gynecological operations.

HOMER I. OSTROM — Metropolitan Hospital, Blackwell's Island — 2:30. Gynecological operations.
GEORGE WATSON ROBERTS — Hahnemann Hospital — 8:30. Gynecological operations.
WM. F. HONAN — Hahnemann Hospital — 2:30. Gynecological operations.
EDWIN B. CRAGIN — Sloane Hospital for Women — 3. Obstetrical operations.
ATTENDING STAFF — Lying-In Hospital — 9 to 10. Demonstration of Laboratories, Wards, After-care, Museums, etc.
WILLIAM A. MORGAN — Lying-In Hospital — 10 to 11. Demonstration of conduct of labor, position, technique.
JAMES W. MARKOE and A. B. DAVIS — Lying-In Hospital — 2:30 to 3:30. Obstetrical and gynecological operations.
J. CLIFTON EDGAR, or AUSTIN FLINT, JR., or C. C. BARROWS — Manhattan Maternity Hospital — 2 to 3:30. Demonstration of the management and technique of the hospital.
W. M. POLK and C. C. BARROWS — Bellevue Hospital. Gynecological operations.
ROBERT H. WYLIE and G. B. LEE — Bellevue Hospital — 9. Gynecological operations. Demonstration of after-treatment of operative cases, and of treatment of patients before operation.
CAROLINE S. FINLEY — New York Infirmary for Women and Children — 2:30. Obstetrical operations.
G. McNAUGHTON — Long Island College Hospital — 9 to 12. Gynecological operations.
J. O. POLAK — Jewish Hospital (Brooklyn) — 9 to 12; 2 to 6. Gynecological operations.
O. P. HUMPSTONE — Jewish Hospital (Brooklyn) — 2 to 4. Obstetrical operations.
RALPH H. POMEROY — Brooklyn Hospital — 9 to 12:30. Gynecological operations.
W. H. CARY — Brooklyn Hospital — 2 to 4. Gynecological clinic; model dispensary, just completed.
A. A. HUSSEY — Brooklyn Hospital — 2 to 4. Obstetrical operations.
E. D. FERRIS — Norwegian Hospital — 10 to 12. Gynecological and surgical operations.
J. F. RANKEN — Prospect Heights Hospital — 10 to 12. Gynecological clinic.
L. G. BALDWIN — St. Peter's Hospital — 9 to 12. Gynecological operations.
J. F. TODD — St. Peter's Hospital — 11 to 1. Gynecological operations.
C. DUNCAN — Swedish Hospital — 10 to 12. Gynecological operations.
H. A. WADE — Williamsburgh Hospital — 1 to 3. Gynecological operations.

Wednesday, November 13th

EDWIN B. CRAGIN — Sloane Hospital for Women — 3. Gynecological operations.
H. J. BOLDT — Post-Graduate Hospital — 9. Gynecological operations.
J. RIDDLE GOFFE — New York Polyclinic Hospital — 8. Gynecological operations.
WILLIAM M. POLK — Bellevue Hospital — 2. Gynecological operations.
CLINTON L. BAGG — Metropolitan Hospital (Homeopathic) — 2:30. Gynecological operations.
AUSTIN FLINT, JR., with W. M. FORD — Woman's Hospital — 9 to 12. Gynecological operations.
C. G. CHILD, JR., and HERMAN GRAD — Woman's Hospital — 9 to 10. Demonstration of Hospital, Wards, Laboratories and Technique. 11.— Demonstration of postoperative results.
CLEMENT CLEVELAND with E. W. PINKHAM — Woman's Hospital — 2 to 6. Gynecological operations.
ATTENDING STAFF — Lying-In Hospital — 9 to 10. Demonstration of Wards, Laboratories, After-care, Museums, etc.
ROSS McPHERSON — Lying-In Hospital — 10 to 11. Demonstration of postpartum treatment.
JAMES W. MARKOE and A. B. DAVIS — Lying-In Hospital — 2:30 to 3:30. Gynecological and obstetrical operations.
LEROY BROUN — Manhattan State Hospital — 2:30. Gynecological operations.
SAMUEL BARLOW MOORE — Metropolitan Hospital (Homeopathic) — 2:30. Obstetrical operations.
J. CLIFTON EDGAR, or AUSTIN FLINT, JR., or C. C. BARROWS — Manhattan Maternity Hospital — 2 to 3:30. Demonstration of the management and technique of the hospital. Obstetrical operations.
H. C. COE and W. E. STUDDIFORD — Bellevue Hospital — 9. Gynecological operations. Demonstration of after-care of operative cases, and of treatment of patients before operation.
MARY D. RUSHMORE — New York Infirmary for Women and Children — 2:30. Gyneological operations.
E. MAYNE and J. C. MACEVITT — Coney Island Hospital — 11 to 1. Gynecological operations.
C. BURNHAM — Cumberland Street Hospital — 1 to 3. Gynecological operations.
F. WEISBROD — German Hospital (Brooklyn) — 10 to 1. Gynecological operations.
A. M. JUDD — Kings County Hospital — 10 to 12. Gynecological operations.
G. McNAUGHTON, C. R. HYDE and A. M. JUDD — Long Island College Hospital — 9 to 12. Gynecological operations.
J. F. RANKEN — Prospect Heights Hospital — 10 to 12. Gynecological clinic.
H. B. DELATOUR — St. John's Hospital — 9 to 12. Gynecological and surgical operations.
J. C. MACEVITT — St. Mary's Hospital — 2 to 4. Gynecological operations.

Thursday, November 14th

W. M. POLK and C. C. BARROWS — Bellevue Hospital — 9. Gynecological operations. Demonstration of after-treatment of operative cases, and of treatment of patients before operation.
L. J. LADINSKI — Beth Israel Hospital — 2. Gynecological operations.
S. W. BANDLER — Beth Israel Hospital — 9. Gynecological operations.
HOWARD C. TAYLOR with WILLIAM P. HEALY — Roosevelt Hospital — 2:30. Gynecological operations.
HENRY C. COE — General Memorial Hospital — 9. Gynecological operations.
GEORGE H. MALLETT — General Memorial Hospital — 11. Gynecological operations.
E. H. GRANDIN — Columbus Hospital — 2. Gynecological operations.
L. J. LADINSKI — Polyclinic Hospital — 8 to 10. Gynecological operations.
ROBERT WYLIE — Polyclinic Hospital — 3 to 5. Gynecological operations.

GUSTAV SEELIGMANN and RALPH WALDO — Lebanon Hospital—9 and 2. Gynecological operations.
HOMER I. OSTROM — Metropolitan Hospital (Homeopathic) — 2:30. Gynecological operations.
F. KRUG, H. N. VINEBERG, and S. WIENER — Mount Sinai Hospital—9. Gynecological operations.
J. RIDDLE GOFFE with C. G. CHILD, JR. — Woman's Hospital — 9. Gynecological operations.
LEROY BROUN with REGINALD M. RAWLS — Woman's Hospital — 2. Gynecological operations.
W. M. FORD and EVERETT M. HAWKS — Woman's Hospital — 9 to 10. Demonstration of Hospital, Wards, Laboratories, Technique, etc. 10 to 11. — Demonstration of postoperative results.
ATTENDING STAFF — Lying-In Hospital — 9 to 10. Demonstration of Wards, Laboratories, etc.
CLINTON B. KNAPP — Lying-In Hospital — 10 to 11. Demonstration of new-born children, treatment of eyes, etc., also demonstrating placentæ.
JAMES W. MARKOE and A. B. DAVIS — Lying-In Hospital — 2:30 to 3:30. Gynecological and obstetrical operations.
C. G. CHILD, JR., or H. S. STEARNS— City Hospital — 2. Gynecological operations.
F. A. DORMAN — City Hospital — 2. Obstetrical operations.
JAMES D. VOORHEES — Sloane Hospital for Women — 2. Obstetrical operations.
P. C. THOMAS — Hahnemann Hospital — 2:30. Obstetrical clinic.
J. CLIFTON EDGAR, or AUSTIN FLINT, JR., or C. C. BARROWS — Manhattan Maternity Hospital — 2 to 3:30. Demonstration of the management and technique of the hospital. Obstetrical operations.
JAMES N. WEST — Post-Graduate Hospital — 9 to 12. Gynecological operations.
H. D. FURNISS — Post Graduate Hospital — 2. Lantern slide demonstration of argyrol and collargol radiographs of the kidneys and ureters.
R. L. DICKINSON — Brooklyn Hospital — 9 to 12. Gynecological operations.
A. A. HUSSEY — Brooklyn Hospital — 2 to 4. Obstetrical operations.
J. MORRIS and V. L. ZIMMERMAN — Holy Family Hospital — 10 to 12. Gynecological operations.
G. McNAUGHTON — Jewish Hospital (Brooklyn) — 9 to 12. Gynecological and obstetrical operations.
R. M. BEACH — Jewish Hospital (Brooklyn) — 2 to 4. Obstetrical operations.
J. O. POLAK, F. C. HOLDEN and N. P. GEIS — Long Island College Hospital — 9 to 12. Gynecological and obstetrical operations.
H. B. DELATOUR — Norwegian Hospital — 9 to 11. Gynecological and surgical operations.
E. D. FERRIS — Norwegian Hospital — 10 to 12. Gynecological and surgical operations.
J. F. RANKEN — Prospect Heights Hospital — 10 to 12. Gynecological clinic.
A. T. BRISTOW — St. John's Hospital — 10 to 1. Gynecological and surgical operations.
L. G. BALDWIN — St. Peter's Hospital — 9 to 12. Gynecological operations.
J. F. TODD — St. Peter's Hospital — 11 to 1. Gynecological operations.
A. M. JUDD — Swedish Hospital — 10 to 12. Gynecological and obstetrical operations.
J. B. DOWD — Williamsburgh Hospital — 2 to 4. Gynecological operations.

Friday, November 15th

G. SEELIGMANN and A. STEIN — German Hospital — 9. Gynecological operations.
F. FOERSTER and F. R. OASTLER — German Hospital — 2. Gynecological operations.
GEORGE GRAY WARD, JR. — Post-Graduate Hospital — 9 to 12. Gynecological operations.
C. F. ADAMS — Columbus Hospital — 2. Gynecological operations.
CLINTON L. BAGG — Metropolitan Hospital (Homeopathic) — 2:30. Gynecological operations.
W. G. CRUMP — Homeopathic Medical College and Flower Hospital — 2 to 4. Gynecological operations.
JOSEPH C. TAYLOR — Polyclinic Hospital — 8 to 10. Gynecological operations.
J. BRETTAUER, S. M. BRICKNER and R. T. FRANK —Mount Sinai Hospital—9. Gynecological operations.
P. F. CHAMBERS with HERMAN GRAD — Woman's Hospital — 9 to 11. Gynecological operations.
R. M. RAWLS and E. W. PINKHAM — Woman's Hospital — 9 to 10. Demonstration of Hospital, Laboratories, Technique and After-care. 10 to 11. — Demonstration of postoperative results.
J. RIDDLE GOFFE with C. G. CHILD, JR. — Woman's Hospital — 2 to 6. Gynecological operations.
LEROY BROUN — Manhattan State Hospital — 2:30. Gynecological operations.
ATTENDING STAFF — Lying-In Hospital — 9 to 10. Demonstration of Wards, Laboratories, etc.
C. F. JELLINGHAUS — Lying-In Hospital — 10 to 11. Demonstration of postoperative cases.
JAMES W. MARKOE and A. B. DAVIS — Lying-In Hospital — 2:30 to 3:30. Gynecological and obstetrical operations.
F. A. DORMAN — Sloane Hospital for Women — 3. Obstetrical clinic.
JOHN HUDSON STORER — Metropolitan Hospital (Homeopathic) — 2:30. Obstetrical clinic.
L. L. DANFORTH — Homeopathic Medical College and Flower Hospital — 5 to 6. Obstetrical clinic.
J. CLIFTON EDGAR, or AUSTIN FLINT, JR., or C. C. BARROWS — Manhattan Maternity — 2 to 3. Demonstration of the management and technique of the hospital. Obstetrical operations.
ROBERT H. WYLIE and G. B. LEE — Bellevue Hospital — 9. Gynecological operations. Demonstration of after-treatment of operative cases, and of treatment of patients before operation.
R. L. DICKINSON — Brooklyn Hospital — 2 to 4. Gynecological operations.
W. H. PIERSON — Cumberland Street Hospital — 1 to 3. Gynecological operations.
H. C. ALLEN and T. A. BUYS — Cumberland Street Hospital — 3 to 5. Obstetrical operations.
J. F. RANKEN — Cumberland Street Hospital — 3 to 5. Gynecological operations.
J. M. WINFIELD — Kings County Hospital — 10 to 12. Syphilis and cancer clinic.
J. F. RANKEN — Prospect Heights Hospital — 10 to 12. Gynecological clinic.
W. B. BRINSMADE — St. John's Hospital — 9 to 12. Gynecological and surgical operations.
J. P. GLYNN — St. Mary's Hospital — 2 to 4. Gynecological operations.
C. A. GORDON — Williamsburgh Hospital — 2 to 4. Gynecological operations.

Saturday, November 16th

HOWARD C. TAYLOR with WILLIAM P. HEALY — Roosevelt Hospital — 2:30. Gynecological operations.
H. J. BOLDT — Post-Graduate Hospital — 9 to 12. Gynecological operations.
H. D. FURNISS—Post Graduate Hospital—2. Cystoscopy and ureteral catheterization.
EDWIN B. CRAGIN — Sloane Hospital for Women — 3. Gynecological operations.
C. G. CHILD — Polyclinic Hospital — 8 to 10. Gynecological operations.
BROOKS H. WELLS — Polyclinic Hospital — 3 to 5. Gynecological operations.
G. WATSON ROBERTS — Hahnemann Hospital — 8:30. Gynecological operations.
DOUGAL BISSELL with EVERETT M. HAWKS — Woman's Hospital — 9. Gynecological operations.
R. M. RAWLS and E. W. PINKHAM — Woman's Hospital — 9 to 10. Demonstration of Hospital, Laboratories, Technique, and After-care. 10.— Demonstration of postoperative cases.
AUSTIN FLINT, JR., with W. M. FORD — Woman's Hospital — 2 to 6. Gynecological operations.
ATTENDING STAFF — Lying-In Hospital — 9 to 10. Demonstration of Wards, Laboratories, After-care, Museums, etc.
GEORGE W. KOSMAK — Lying-In Hospital — 10 to 11. Demonstration of care of cases of labor at patients' homes.
JAMES W. MARKOE and A. B. DAVIS — Lying-In Hospital — 2:30 to 3:30. Gynecological and obstetrical operations.
J. CLIFTON EDGAR, or AUSTIN FLINT, JR., or C C. BARROWS — Manhattan Maternity Hospital — 2 to 3:30. Demonstration of the management and technique of the hospital. Obstetrical clinics.
H. C. COE and W. E. STUDDIFORD — Bellevue Hospital — 9. Gynecological operations. Demonstrations of the after-treatment of operative cases, and of the treatment of patients before operation, etc.
F. WEISBROD — German Hospital (Brooklyn) — 10 to 1. Gynecological operations.
J. O. POLAK — Jewish Hospital (Brooklyn) — 9 to 12. Gynecological operations.
A. M. JUDD — Jewish Hospital (Brooklyn) — 9 to 12. Gynecological operations.
O. P. HUMPSTONE — Jewish Hospital (Brooklyn) — 2 to 4. Obstetrical operations.
E. PALMER, C. R. HYDE and W. P. POOL — Long Island College Hospital — 9 to 12. Gyn. operations.
J. F. RANKEN — Prospect Heights Hospital — 10 to 12. Gynecological clinic.

ORTHOPEDIC SURGERY

Monday, November 11th

VIRGIL P. GIBNEY and ARTHUR H. CILLEY — Hospital for Ruptured and Crippled — 8:30.
RUSSELL A. HIBBS — Orthopedic Hospital — 8:30.
FRED H. ALBEE — Roosevelt Hospital — 9:30 to 11.
JAMES P. FISKE — New York Hospital — 10 to 11.
CHARLES H. JAEGER — Vanderbilt Clinic — 10 to 12.
HOMER GIBNEY — New York School of Clinical Medicine — 12 to 2.
R. H. SAYRE — University and Bellevue Hospital Medical College — 1 to 3.
FRED H. ALBEE — Cornell University — 1 to 3.
WISNER R. TOWNSEND — Hospital for Ruptured and Crippled — 1 to 3.
DEXTER D. ASHLEY — German Polyclinic — 1 to 3.
P. W. NATHAN — Mt. Sinai Hospital — 1 to 3.
B. P. FARRELL — Orthopedic Hospital — 1:30 to 4.
WALTER TRUSLOW — Methodist Episcopal Hospital — 2 to 3.
CHARLES D. NAPIER and WALTER TRUSLOW — Kings County Hospital — 3 to 5.
HENRY LING TAYLOR — Post Graduate Hospital — 4:30 to 5:30.

Tuesday, November 12th

RUSSELL A. HIBBS — Orthopedic Hospital — 8:30 to 12.
VIRGIL P. GIBNEY and ROYAL WHITMAN — Hospital for Ruptured and Crippled — 8:30 to 12.
FRED H. ALBEE — Roosevelt Hospital — 9:30 to 11.
HENRY W. FRAUENTHAL — Hospital for Deformities and Joint Diseases — 9 to 11.
IRVING D. STEINHARDT — New York Hospital — 10 to 11.
CHARLES H. JAEGER — Vanderbilt Clinic — 10 to 12.
ROYAL WHITMAN — Hospital for Ruptured and Crippled — 1 to 3.
CARL R. KEPPLER — German Polyclinic — 1 to 3.
P. W. ROBERTS — Mt. Sinai Hospital — 1 to 3.
H. J. BOGARDUS — Orthopedic Hospital — 1:30 to 4.
W. B. THOMPSON — Polyclinic Hospital — 4:30 to 5:30.
T. HALSTED MYERS — St. Luke's Hospital — 2 to 4.
J. M. CLAYLAND — St. Mary's Hospital (Brooklyn) — 1 to 4.
CHARLES OGILVY and ARTHUR H. CILLEY — Post Graduate Hospital — 4:30 to 5:30.

Wednesday, November 13th

VIRGIL P. GIBNEY — Hospital for Ruptured and Crippled — 8:30.
RUSSELL A. HIBBS — Orthopedic Hospital — 8:30.
FRED H. ALBEE — Roosevelt Hospital — 9:30 to 11.
JAMES P. FISKE — New York Hospital — 10 to 11.
CHARLES H. JAEGER — Vanderbilt Clinic — 10 to 12.
HOMER GIBNEY — New York School of Clinical Medicine — 12 to 2.
R. H. SAYRE — University and Bellevue Hospital Medical College — 1 to 3.
FRED H. ALBEE — Cornell University — 1 to 3.
WISNER R. TOWNSEND — Hospital for Ruptured and Crippled — 1 to 3.
P. W. NATHAN — Mt. Sinai Hospital — 1 to 3.
DEXTER D. ASHLEY — German Polyclinic — 1 to 3.
B. P. FARRELL — Orthopedic Hospital — 1:30 to 4.
CHARLES D. NAPIER and WALTER TRUSLOW — Kings County Hospital (Brooklyn) — 3 to 5.
HENRY LING TAYLOR — Post Graduate Hospital — 4:30 to 5:30.

Thursday, November 14th

CARL R. KEPPLER — Fordham Hospital — 8:30.
VIRGIL P. GIBNEY and ARTHUR H. CILLEY — Hospital for Ruptured and Crippled — 8:30.

RUSSELL A. HIBBS — Orthopedic Hospital — 8:30.
HENRY W. FRAUENTHAL — Hospital for Deformities and Joint Diseases — 9 to 11.
CHARLES A. OGILVY and A. S. TAYLOR — Randall's Island Hospital — 9.
IRVING D. STEINHARDT — New York Hospital — 10 to 11.
CARL R. KEPPLER — Fordham Hospital — 10 to 11.
CHARLES H. JAEGER — Vanderbilt Clinic — 10 to 12.
ROYAL WHITMAN — Hospital for Ruptured and Crippled — 1 to 3.
CARL R. KEPPLER — German Polyclinic — 1 to 3.
P. W. ROBERTS — Mt. Sinai Hospital — 1 to 3.
H. J. BOGARDUS — Orthopedic Hospital — 1:30 to 4.
FRED H. ALBEE — Roosevelt Hospital — 2.
WALTER TRUSLOW — Methodist Episcopal Hospital (Brooklyn) — 2 to 3.
CHARLTON WALLACE — Polyclinic Hospital — 4:30.
CHARLES OGILVY — Post Graduate Hospital — 4:30

Friday, November 15th

WILLIAM B. COLEY and JOHN B. WALKER — Hospital for Ruptured and Crippled — 8:30. Hernia clinic.
RUSSELL A. HIBBS — Orthopedic Hospital — 8:30.
FRED H. ALBEE — Roosevelt Hospital — 9:30 to 11.
JAMES P. FISKE — New York Hospital — 10 to 11.
CHARLES H. JAEGER — Vanderbilt Clinic — 10 to 12.
HOMER GIBNEY — New York School of Clinical Medicine — 12 to 2.
WISNER R. TOWNSEND — Hospital for Ruptured and Crippled — 1 to 3.
FRED H. ALBEE — Cornell University — 1 to 3.
R. H. SAYRE — University and Bellevue Hospital Medical College — 1 to 3.
P. W. NATHAN — Mt Sinai Hospital — 1 to 3.
DEXTER D. ASHLEY — German Polyclinic — 1 to 3.
B. P. FARRELL — Orthopedic Hospital — 1:30 to 4.
T. HALSTED MYERS — St. Luke's Hospital — 2 to 4.
CHARLES D. NAPIER and WALTER TRUSLOW — Kings County Hospital (Brooklyn) — 3 to 5.
FRED H. ALBEE — Post Graduate Hospital — 4:30 to 5:30.

Saturday, November 16th

RUSSELL A. HIBBS — Orthopedic Hospital — 8:30.
VIRGIL P. GIBNEY and ARTHUR H. CILLEY — Hospital for Ruptured and Crippled — 8:30.
FRED H. ALBEE — Roosevelt Hospital — 9:30 to 11.
IRVING D. STEINHARDT — New York Hospital — 10 to 11.
CHARLES H. JAEGER — Vanderbilt Clinic — 10 to 12.
P. W. ROBERTS — Mt. Sinai Hospital — 1 to 3.
ROYAL WHITMAN — Hospital for Ruptured and Crippled — 1 to 3.
FRED H. ALBEE — Cornell University — 1 to 3.
CARL R. KEPPLER — German Polyclinic — 1 to 3.
H. J. BOGARDUS — Orthopedic Hospital — 1:30 to 4.
ROYAL WHITMAN — Polyclinic Hospital — 4:30.
CHARLES OGILVY — Post Graduate Hospital — 4:30.

GENITO-URINARY SURGICAL CLINICS

NEW YORK CITY

EDWARD L. KEYES, JR. — Bellevue Hospital — Nov. 16, 9 A. M. Operative clinic.
A. T. OSGOOD — Bellevue Hospital. Operative clinic.
J. RAYNOR HAYDEN — Bellevue Hospital — Nov. 16, 2 P. M. Operative clinic.
J. BAYARD CLARKE — Bellevue Hospital. Operative clinic.
J. F. McCARTHY — Bellevue Hospital. Operative clinic.
EUGENE FULLER — City Hospital — Nov. 13 and 16, 2 P. M. Surgery of the seminal vesicles.
FRANCIS CARTER WOOD — Columbia University, Medical Department. Exhibition of pathological genito-urinary specimens.
RAMON GUITERAS — Columbus Hospital. Operative clinic.
WILLY MEYER — German Hospital. Operative clinic.
GEORGE K. SWINBURNE — Good Samaritan Dispensary. Operative clinic.
J. F. ERDMANN — Gouverneur Hospital. Operative clinic (kidney).
BUKK G. CARLETON — Hahnemann Hospital — Nov. 12, 2 P. M. Operative clinic.
SPRAGUE CARLETON — Hahnemann Hospital. Operative clinic.
J. J. MOREHEAD — Harlem Hospital. Operative clinic.
BUKK G. CARLETON — Flower Hospital. Operative clinic.
SPRAGUE CARLETON — Flower Hospital — Nov. 12 and 16. Operative clinic.
CHARLES H. CHETWOOD — J. Hood Wright Hospital. Operative clinic.
BUKK G. CARLETON — Metropolitan Hospital — Nov. 11 and 15. Operative clinic.
SPRAGUE CARLETON — Metropolitan Hospital. Operative clinic.
EDWIN BEER — Mt. Sinai Hospital. Operative clinic.
LEO BUERGER — Mt. Sinai Hospital — Nov. 11, 9 A. M., general clinic; Nov. 13, 2 P. M., operative clinic.
HOWARD LILIENTHAL — Mt. Sinai Hospital. Operative clinic.
FRED S. MANDELBAUM — Mt. Sinai Hospital — Nov. 11, 9 A. M. Genito-urinary pathology.
HERMAN GOLDENBERG — Mt. Sinai Hospital. Treatment of lues.
J. BENTLEY SQUIER — New York City Home Hospital. Operative clinic.
K. B. PAGE — Peoples Hospital. Operative clinic.
A. L. WOLBARST — Peoples Hospital. Demonstration of urinary tests.
CHARLES H. CHETWOOD — Polyclinic Hospital. General clinic daily.
J. BENTLEY SQUIER — Post Graduate Hospital — Nov. 13, 12 M., operative clinic (prostatic surgery). General clinic daily.
EUGENE FULLER — Post Graduate Hospital. Operative clinic.
RAMON GUITERAS — Post Graduate Hospital. Operative clinic (extrophy of bladder).
J. F. ERDMANN — Post Graduate Hospital. Operative clinic (kidney surgery).
J. F. McCARTHY — Post Graduate Hospital. Operative cystoscopy.
JAMES PEDERSEN — Post Graduate Hospital. Clinical teaching.

C. G. BANDLER—Post Graduate Hospital. General clinic.
C. A. McWILLIAMS — Presbyterian Hospital. Operative clinic.
GEORGE E. BREWER — Roosevelt Hospital. Operative clinic (kidney surgery).
WILLIAM B. COLEY — Ruptured and Crippled Hospital. Operative clinic (undescended testicle).
JOHN B. WALKER — Ruptured and Crippled Hospital. Operative clinic.
FRANCIS C. EDGERTON — St. Francis Hospital. Operative clinic.
JOHN PATRICK McGOWAN — St. Bartholomew's clinic. Demonstration.
E. E. SMITH — Smith Private Laboratory. Demonstration of Wasserman reaction.
FREDERICK E. SONDERN — Sondern Private Laboratory. Demonstration of laboratory technique in genito-urinary diagnosis.
J. BENTLEY SQUIER — Sailors' Snug Harbor Hospital. Operative clinic.
R. N. SEVERANCE — Sailors' Snug Harbor Hospital. Operative clinic.
J. RAYNOR HAYDEN — Vanderbilt Clinic. General clinic daily.
FREDERICK BIERHOFF — West Side German Dispensary. Modern methods of dispensary treatments.

BROOKLYN

N. P. RATHBUN — Brooklyn Hospital — Nov. 11, 13 and 15, 1 to 3. General clinics.
W. R. ISZARD — Cumberland Street Hospital — Nov. 11, 9 to 11. General clinic.
B. HARRIS — German Hospital (Brooklyn) — Nov. 11, 10. General clinic.
V. H. PENTLARGE — Jewish Hospital — Nov. 11, 13 and 15, 2 to 4. General clinics.
H. E. FRASER — Kings County Hospital — Nov. 16, 2 to 4. Operative clinic.
H. H. MORTON — Long Island College Hospital — Nov. 11, 2 to 4; Nov. 14, 10 to 12. Kings County Hospital, Nov. 13, 10 to 12. Operative clinics.
J. S. READ, F. M. PILCHER, W. R. ISZARD, B. HARRIS and R. DURHAM — Long Island College Hospital — Nov. 15, 2 to 4. General clinic.
J. STURDIVANT READ — Long Island Island College Hospital. Cystoscopic demonstrations.
R. DURHAM — Methodist Episcopal Hospital — Nov. 13, 11 to 1. General clinic.
PAUL M. PILCHER — Pilcher Private Hospital. Operative clinic (renal, vesical and prostatic cases).
P. M. PILCHER — St. John's Hospital — Nov. 14, 10 to 12. General clinic.

OPHTHALMOLOGICAL CLINICS

Monday, November 11th

RUDOLF DENIG and M. HEIMANN — German Hospital — 2 to 4.
DAVID WEBSTER and staff — Manhattan Eye, Ear and Throat Hospital — 2.
PETER A. CALLAN and L. W. CALLAN — New York Eye and Ear Infirmary — 2 to 5.
GEORGE S. DIXON — New York Eye and Ear Infirmary — 3. See Note A.
J. D. RUSHMORE, W. S. SHATTUCK and J. W. INGALLS — Brooklyn Eye and Ear Hospital — 2 to 4.
J. S. WOOD and W. H. SNYDER — Brooklyn Eye and Ear Hospital — 3 to 4.

Tuesday, November 12th

J. B. EMERSON, E. S. THOMPSON and staff — Manhattan Eye, Ear and Throat Hospital,— 2.
CARL KOLLER — Mt. Sinai Hospital — 2:30.
HENRY R. PRICE — New York Eye and Ear Infirmary — 3 to 4.
C. H. HELFRICH and A. B. NORTON — New York Ophthalmic Hospital — 2 to 5.
GEORGE S. DIXON — New York Eye and Ear Infirmary — 3.
H. H. WAUGH — Brooklyn Eye and Ear Hospital — 2 to 3.
W. SIMMONS and N. L. NORTH — Brooklyn Eye and Ear Hospital — 2 to 4.
D. W. MEYER — Brooklyn Eye and Ear Hospital — 3 to 4.

Wednesday, November 13th

N. J. HEPBURN, E. L. OATMAN and staff — Manhattan Eye, Ear and Throat Hospital — 2.
WALTER E. LAMBERT — New York Eye and Ear Infirmary — 2 to 4.
GEORGE S. DIXON — New York Eye and Ear Infirmary — 3.
ARNOLD KNAPP — New York Ophthalmic and Aural Institute — 2 to 4.
C. C. BOYLE and E. S. MUNSON — New York Ophthalmic Hospital — 2 to 5.
A. E. DAVIS — New York Post Graduate Hospital — 2 to 4.
F. DE F. BAILEY — Brooklyn Eye and Ear Hospital — 2.
J. S. WOOD — Kings County Hospital — 2 to 4.

Thursday, November 14th

R. S. COPELAND — Flower Hospital — 3.
F. E. D'OENCH and O. SCHIRMER — German Hospital — 2 to 4.
FRANK VAN FLEET and staff — Manhattan Eye, Ear and Throat Hospital — 2.
J. E. WEEKS — New York Eye and Ear Infirmary — 2 to 4.
R. G. REESE — New York Eye and Ear Infirmary — 3 to 5.
GEORGE S. DIXON — New York Eye and Ear Infirmary — 3.
F. H. BOYNTON and G. DE W. HALLETT — New York Ophthalmic Hospital — 2 to 5.
J. W. INGALLS — Brooklyn Eye and Ear Hospital — 2 to 3.
J. S. WOOD and W. H. SNYDER — Brooklyn Eye and Ear Hospital — 2 to 4.
W. SIMMONS — Brooklyn Eye and Ear Hospital — 3 to 4.

Friday, November 15th

RUDOLF DENIG — German Hospital — 2 to 4.
J. E. GILES and staff — Manhattan Eye, Ear and Throat Hospital — 2.

EMIL GRUENING — New York Eye and Ear Infirmary — 2 to 4.
GEORGE S. DIXON — New York Eye and Ear Infirmary — 3.
ARNOLD KNAPP — New York Ophthalmic and Aural Institute — 2 to 4.
C. DEADY and F. G. RITCHIE — New York Ophthalmic Hospital — 2 to 5.
H. H. WAUGH and F. DE F. BAILEY — Brooklyn Eye and Ear Hospital — 2 to 4.
J. D. RUSHMORE — Brooklyn Eye and Ear Hospital — 2 to 3.
W. SIMMONS — Brooklyn Eye and Ear Hospital — 3 to 4.

Saturday, November 16th

CARL KOLLER — Mt. Sinai Hospital — 2:30.
WILBUR MARPLE — New York Eye and Ear Infirmary — 2 to 4.
GEORGE S. DIXON — New York Eye and Ear Infirmary — 3.
A. E. DAVIS — New York Post Graduate Hospital — 2 to 4.
D. W. MEYER — Brooklyn Eye and Ear Hospital — 2 to 4.
J. S. WOOD — Brooklyn Eye and Ear Hospital — 3.
H. D. SCHENCK — Cumberland Street Hospital — 2 to 3.

NOTE A. Dr. Geo. S. Dixon will demonstrate the method employed for localization of foreign bodies in and about the eye-ball by means of X-ray skiagraphy at 3 P. M. daily.

NOTE B. Saturday, November 16th, at 2 P. M., the Committee of the Manhattan Eye, Ear and Throat Hospital will be prepared to take visitors through the institution and show any special features of the work in which they may be interested. Clinical cases of unusual interest will be shown at 2 P. M. daily. Demonstration of a series of radiographs of the sinuses will be given on any day of the meeting at 3 P. M.

LARYNGOLOGICAL CLINICS

Monday, November 11th

LEWIS A. COFFIN — Manhattan Eye, Ear and Throat Hospital — 2.
EMIL MAYER and SIDNEY YANKAUER — Mt. Sinai Dispensary — 2 to 4.
CHARLES E. TEETS — New York Ophthalmic Hospital — 2 to 4.
C. C. RICE — New York Post Graduate Hospital — 2.
B. O. SHEEDY — New York Post Graduate Hospital — 8. P. M.
C. E. PAINE — Cumberland Street Hospital — 2 to 3.
H. ARROWSMITH and assistants — Kings County Hospital — 3 to 4.

Tuesday, November 12th

D. MACPHERSON, W. W. CARTER and F. W. WHITE — Manhattan Eye, Ear and Throat Hospital — 11.
HARMON SMITH — Manhattan Eye, Ear and Throat Hospital — 2.
J. W. GLEITSMAN and JOHN HORN — German Hospital — 3:30.
HAROLD HAYS — New York Eye and Ear Infirmary — 2.
D. BRYSON DELAVAN — New York Polyclinic Hospital — 2 to 3:30.
BEAMAN DOUGLASS — New York Post Graduate Hospital — 2.
L. M. HURD and H. H. CURTIS — New York Throat, Nose and Lung Hospital — 3.
W. A. CHISHOLM — University and Bellevue Hospital clinic — 2.
C. G. CRANE and F. H. LASHER — Brooklyn Hospital Dispensary — 2.
P. H. STURGES and A. C. HOWE — Jewish Hospital (Brooklyn) — 2 to 3.
J. KEPKE — Long Island College Hospital — 2 to 3.
J. MEYER — St. Catherine's Hospital — 3 to 4.
L. A. McCLELLAND — Williamsburgh Hospital — 1 to 3.

Wednesday, November 13th

C. G. COAKLEY — Miss Alston's Sanatorium — 8. Killian sinus operation.
F. HORN and H. EHRMANN — German Hospital — 2.
C. E. MUNGER, EDGAR H. FARR, G. H. COCKS, J. D. KERNAN and G. M. PHELPS — Manhattan Eye, Ear and Throat Hospital — 11.
W. F. CHAPPEL — Manhattan Eye, Ear and Throat Hospital — 2.
EMIL MAYER and SIDNEY YANKAUER — Mt. Sinai Dispensary — 2 to 4.
I. TOWNSEND — New York Ophthalmic Hospital — 2 to 4.
ROBERT G. MYLES — New York Polyclinic Hospital 2:30.
T. J. HARRIS — Post Graduate Hospital — 1.
C. C. RICE — Post Graduate Hospital — 2.
J. A. MACISAAC and R. J. HELD — New York Throat, Nose and Lung Hospital — 3.
F. S. MATHEWS — St. Mary's Free Hospital for Children — 9.
JOHN McCOY — University and Bellevue Hospital Clinic — 2.
W. M. GARDNER and L. T. JACKMAN — Samaritan Hospital — 2 to 4.

Thursday, November 14th

J. E. MACKENTY and J. H. GUNTZER — Manhattan Eye, Ear and Throat Hospital — 11.
S. OPPENHEIMER and MILTON BALLIN — Mt. Sinai Dispensary — 3.
F. J. QUINLAN — New York Polyclinic Hospital — 2:30.
T. J. HARRIS — Post Graduate Hospital — 1.
B. DOUGLASS — Post Graduate Hospital — 2.
B. O. SHEEDY — Post Graduate Hospital — 8 P. M.
S. GOLDSTEIN and H. H. CURTIS — New York Throat, Nose and Lung Hospital — 3.
H. JARECKY — Sydenham Hospital — 2.
W. A. CHISHOLM — University and Bellevue Hospital Clinic — 2.
C. G. COAKLEY — University and Bellevue Hospital Clinic — 2.
A. WORRALL PALMER — New York Ophthalmic Hospital — 2 to 4.
F. C. RAYNOR and W. H. STEERS — Brooklyn Eye and Ear Hospital — 2 to 4.

J. H. DROGE — German Hospital (Brooklyn) — 2 to 4.
R. L. MOORHEAD — German Hospital (Brooklyn) — 3 to 4.
T. R. FRENCH, W. F. DUDLEY and P. H. STURGES — Long Island College Hospital — 3:30.

Friday, November 15th

T. J. HARRIS, S. McCULLAGH, W. N. HUBBARD, E. V. HUBBARD and S. W. ROOF — Manhattan Eye, Ear, and Throat Hospital — 11.
W. FREUDENTHAL — Beth Israel Hospital — 1 to 5.
JOSEPH H. ABRAHAM — New York Polyclinic Hospital — 2 to 3:30.
C. C. RICE — Post Graduate Hospital — 2.
JOHN McCOY — University and Bellevue Hospital Clinic — 2.
H. ARROWSMITH and F. L. TUCKER — Brooklyn Eye and Ear Hospital — 1:30 to 3:30.

Saturday, November 16th

J. GLEITSMANN and F. COHN — German Hospital — 2.
S. H. VEHSLAGE — New York Ophthalmic Hospital — 2 to 4.
T. J. HARRIS — New York Post Graduate Hospital — 1.
F. S. LOVELL — New York Post Graduate Hospital — 2.

OTOLOGICAL CLINICS

Monday, November 11th

SIDNEY YANKAUER — Mt. Sinai Hospital — 2 to 4.
ARTHUR B. DUEL — Manhattan Eye, Ear and Throat Hospital — 2 to 4.
JAMES F. McKERNON — Manhattan Eye, Ear and Throat Hospital — 3 to 5.
EDWARD B. DENCH — New York Eye and Ear Infirmary — 3 to 5.
ARTHUR B. DUEL — New York Polyclinic Hospital — 5.
W. C. PHILLIPS — New York Post Graduate Hospital — 2:30 to 5.
H. A. ALDERTON — Brooklyn Eye and Ear Hospital — 2.
B. H. SHEA — Cumberland Street Hospital — 4 to 5.

Tuesday, November 12th

W. C. PHILLIPS — Manhattan Eye, Ear and Throat Hospital — 2 to 4.
T. P. BERENS — Manhattan Eye, Ear and Throat Hospital — 3 to 5.
GORHAM BACON — New York Eye and Ear Infirmary — 3 to 5.
GEORGE W. McDOWELL — New York Ophthalmic Hospital — 2.
P. D. KERRISON — New York Polyclinic Hospital — 5.
JAMES F. McKERNON — New York Post Graduate Hospital — 2:30 to 5.
R. J. HELD — New York Throat, Nose and Lung Hospital — 2 to 4.
W. C. BRAISLIN and S. H. LUTZ — Brooklyn Eye and Ear Hospital — 2 to 4.

Wednesday, November 13th

R. L. LOUGHRAN — Manhattan Eye, Ear and Throat Hospital — 2 to 4.
FRED WHITING — New York Eye and Ear Infirmary — 3 to 5.
JOHN R. PAGE — New York Polyclinic Hospital — 5.
JOHN B. RAE — New York Post Graduate Hospital — 2:30 to 5.
W. S. SHATTUCK — Brooklyn Eye and Ear Hospital — 2 to 4.
C. N. COX — Brooklyn Eye and Ear Hospital — 2.
J. E. SHEPPARD — Long Island College Hospital — 3 to 4.

Thursday, November 14th

W. C. PHILLIPS — Manhattan Eye, Ear and Throat Hospital — 2 to 4.
T. P. BERENS — Manhattan Eye, Ear and Throat Hospital — 3 to 5.
DAVID G. YATES — New York City Hospitals (Randall's Island) — 2 to 4.
WILLIAM L. CULBERT — New York City Hospitals (Randall's Island) — 3 to 5.
JOHN L. ADAMS — New York Eye and Ear Infirmary — 3 to 5.
J. HENRY GUNTZER — New York Polyclinic Hospital — 5.
R. L. LOUGHRAN — New York Post Graduate Hospital — 2:30 to 5.
S. J. KOPETZKY — New York Red Cross Hospital — — 2:30.
R. J. HELD — New York Throat, Nose and Lung Hospital — 2 to 4.
JAMES W. CASSELL — J. Hood Wright Hospital — 2 to 4.
B. C. COLLINS — Brooklyn Eye and Ear Hospital — 2 to 4.
W. S. SHATTUCK — Brooklyn Eye and Ear Hospital — 3:30 to 5.

Friday, November 15th

ARTHUR B. DUEL — Manhattan Eye, Ear and Throat Hospital — 2 to 4.
JOHN B. RAE — Manhattan Eye, Ear and Throat Hospital — 3 to 5.
JOSEPH A. KENEFICK — New York Eye and Ear Infirmary — 3 to 5.
GEORGE A. SHEPARD — New York Ophthalmic Hospital — 2.
ARTHUR B. DUEL — New York Polyclinic Hospital — 5.
W. C. PHILLIPS — New York Post Graduate Hospital — 2:30 to 5.
W. C. BRAISLIN, C. N. COX, W. S. SHATTUCK and H. A. ALDERTON — Brooklyn Eye and Ear Hospital — 2 to 4.
S. LUTZ — Brooklyn Eye and Ear Hospital — 3:30 to 5.

Saturday, November 16th

W. C. PHILLIPS — Manhattan Eye, Ear and Throat Hospital — 2 to 4.
S. McCULLAGH — Manhattan Eye, Ear and Throat Hospital — 3 to 5.
FRED WHITING — Mt. Sinai Hospital — 2 to 4.
S. OPPENHEIMER — Mt. Sinai Hospital — 3 to 5.
GEORGE E. STEEL — New York City Hospitals (Randall's Island) — 2 to 4.
C. J. COLLES — New York City Hospitals (Randall's Island) — 3 to 5.

ROBERT LEWIS — New York Eye and Ear Infirmary — 3 to 5.
P. D. KERRISON — New York Polyclinic Hospital — 5.
JOHN B. RAE — New York Post Graduate Hospital — 2:30 to 5.
R. J. HELD — New York Throat, Nose and Lung Hospital — 2 to 4.
B. C. COLLINS — Brooklyn Eye and Ear Hospital — 2 to 4.

LABORATORY DEMONSTRATIONS

Cornell Medical College

Departments of Anatomy and of Experimental Surgery, Pathology and Therapeutics — two afternoons.

JOHN A. HARTWELL and J. P. HOGUET — Pathology and treatment of high intestinal obstruction.
S. P. BEEBE and RICHARD WEIL — Cancer problems.
R. A. HATCHER — Pharmacodynamics in its relations to surgery.
DR. KOCHER — Studies in serum and vaccine therapy and surgical pathology.

College of Physicians and Surgeons

GEORGE S. HUNTINGTON — Department of Anatomy — November 14, 10 A. M. Lecture and demonstration of specimens: Structure and development of the genito-urinary tract, with special reference to surgical conditions.
WILLIAM G. MACCALLUM — Department of Pathology — November 14, 12 M. Demonstration of specimens and the result of studies in experimental pathology.
C. C. LIEB — Department of Pharmacology and Therapeutics — November 15, 10 A. M. Emergency stimulation in the operating room.
JOSEPH A. BLAKE — Department of Surgery — November 15, afternoon. A demonstration of the student course in surgical technique and demonstration of results of experiments in the surgical laboratories.
FRANK H. PIKE — Department of Physiology — November 15, afternoon. Demonstration of experimental lesions in the central nervous system.
H. B. WILLIAMS — Department of Physiology — November 15, afternoon. Demonstration of electrocardiagrams.
WILLIAM C. CLARKE and assistants — Department of Experimental Surgery and Surgical Pathology — Demonstration of methods of teaching operative surgery. Demonstration of problems pertaining to experimental surgery and to surgical pathology and therapeutics.
J. E. MCWHORTER — Department of Surgical Pathology — Demonstration of the growth of tissues in vitro

University and Bellevue Hospital Medical College

DOUGLAS SYMMERS — Department of Pathology — Demonstration on one or two afternoons on subjects yet to be determined.
H. C. JACKSON — Department of Physiology.
GEORGE B. WALLACE — Department of Pharmacology.
GEORGE D. STEWART and A. M. WRIGHT — Department of Experimental Surgery.

The following Laboratories and Hospitals have promised to provide exhibitions and demonstrations:

Rockefeller Institute, under the direction of DR. SIMON FLEXNER, will provide demonstrations in subjects pertaining to experimental surgery and surgical pathology and therapeutics on at least one day. DR. ALEXIS CARREL and DR. S. J. MELTZER will contribute.
Post-Graduate Medical School and Hospital — On the afternoon of November 11th demonstrations by the Departments of Pathological Chemistry, Bacteriology, Pathology, Tropical Medicine, with exhibition of the new laboratories. Remarks on the work of the New York Post-Graduate Pellagra Commission. Demonstrations: Trypanosoma growing in vitro. Animal parasites, protozoa, malaria, etc. Hatching of miracidium of schistosoma hæmatobium. Routine examinations in division of pathological chemistry. Sections of some of the rarer tumors.
Polyclinic Medical School and Hospital, in its new quarters at 345 W. 50th Street.—Department of Pathology under the direction of DR. F. M. JEFFRIES and his assistants.
St. Luke's Hospital — Pathological Department under the direction of DR. F. C. WOOD.
Presbyterian Hospital — Pathological Department under the direction of DR. MCCALLUM.
German Hospital — Demonstration in Serology, by DR. A. GARBAT, Nov. 12th and 15th, 3 P. M. Demonstration in Pathology, by DR. F. HUMPHREYS, Nov. 13th, 3 P. M.
Roosevelt Hospital — Pathological Department under the direction of DR. WARREN; sub-department of clinical pathology under the direction of DR. WILLIAM LYLE.
Mt. Sinai Hospital — Pathological Department under the direction of DR. F. S. MANDELBAUM.
Bellevue Hospital — Pathological Department under the direction of DR. NORRIS.
Lying-In Hospital — Pathological Department under the direction of DR. LOSEE.
Private laboratories of DR. FREDERIC E. SONDERN and DR. E. E. SMITH will be open for inspection and the demonstration of specimens and the technique of the preparation of material for diagnostic and therapeutic purposes.

CLINICS IN BROOKLYN HOSPITALS

Monday, November 11th

W. C. WOOD — Brooklyn Hospital — 10 to 12. Surgical operations.
N. P. RATHBUN — Brooklyn Hospital — 1 to 3. Genito-urinary clinic. New Dispensary.
J. E. JENNINGS — Brooklyn Hospital — 2 to 4. Surgical operations.
H. A. ALDERTON — Brooklyn Eye and Ear Hospital — 2. Ear operations.
J. D. RUSHMORE, W. S. SHATTUCK and J. W. INGALLS — Brooklyn Eye and Ear Hospital — 2 to 4. Eye clinics.

J. S. WOOD and W. H. SNYDER — Brooklyn Eye and Ear Hospital — 3 to 4. Eye operations.
W. H. RANKIN — Coney Island Hospital — 11 to 1. Gynecological operations.
A. H. BOGART — Coney Island Hospital — 2 to 4. Surgical operations.
W. R. ISZARD — Cumberland Street Hospital — 9 to 11. Genito-urinary clinic.
C. E. PAINE — Cumberland Street Hospital — 2 to 3. Nose and throat clinic.
B. H. SHEA — Cumberland Street Hospital — 4 to 5. Ear operations.
R. S. FOWLER — German Hospital — 10 to 1. Surgical operations.
B. HARRIS — German Hospital — 10. Genito-urinary clinic.
W. LINDER — Jewish Hospital — 9 to 12. Surgical operations.
W. L. DUFFIELD — Jewish Hospital — 2 to 4. Surgical operations.
V. H. PENTLARGE — Jewish Hospital — 2 to 4. Genito-urinary clinic.
S. J. McNAMARA — Kings County Hospital — 10 to 12. Gynecological operations.
H. ARROWSMITH and assistants — Kings County Hospital — 3 to 4. Nose and throat operations.
J. C. RUSHMORE — Long Island College Hospital — 9 to 12. Surgical operations.
H. H. MORTON — Long Island College Hospital — 2 to 4. Genito-urinary operations.
J. B. BOGART — Methodist Episcopal Hospital — 9 to 11. Surgical operations.
W. A. SHERWOOD — Methodist Episcopal Hospital — 11 to 1. Surgical operations.
B. D. HARRINGTON — Midwood Hospital — 9 to 12. Surgical operations.
H. B. DELATOUR — Norwegian Hospital — 9 to 11. Gynecological and surgical operations.
L. S. PILCHER and P. M. PILCHER — Pilcher Private Hospital — 9 to 12. Surgical operations.
O. S. RITCH — Prospect Heights Hospital — 3 to 5. Surgical operations.
J. D. SULLIVAN — St. Mary's Hospital — 10 to 1. Surgical operations.
W. L. CHAPMAN — Swedish Hospital — 10 to 12. Surgical operations.

Tuesday, November 12th

R. H. POMEROY — Brooklyn Hospital — 9 to 12. Gynecological operations.
W. H. CARY — Brooklyn Hospital — 2 to 4. Gynecological clinic. Model Dispensary, just completed.
A. A. HUSSEY — Brooklyn Hospital — 2 to 4. Obstetrical operations.
C. G. CRANE and F. H. LASHER — Brooklyn Hospital Dispensary — 2. Nose and throat clinic.
W. C. BRAISLIN and S. H. LUTZ — Brooklyn Eye and Ear Hospital — 2 to 4. Ear clinics.
H. H. WAUGH — Brooklyn Eye and Ear Hospital — 2 to 3. Eye operations.
W. SIMMONS and N. L. NORTH — Brooklyn Eye and Ear Hospital — 2 to 4. Eye clinics.
D. W. MEYER — Brooklyn Eye and Ear Hospital — 3 to 4. Eye operations.
E. H. FISKE — Coney Island Hospital — 2 to 4. Surgical operations.
R. F. WALMSLEY — Cumberland Street Hospital — 1 to 3. Surgical operations.
S. W. PALLISTER — Cumberland Street Hospital — 3 to 5. Surgical operations.
J. P. WARBASSE — German Hospital — 10 to 1. Surgical operations.
J. M. DOWNEY — Holy Family Hospital — 2 to 4. Surgical operations.
J. O. POLAK — Jewish Hospital — 9 to 12; 2 to 6. Gynecological operations.
O. P. HUMPSTONE — Jewish Hospital — 2 to 4. Obstetrical operations.
P. H. STURGES and A. C. HOWE — Jewish Hospital — 2 to 3. Nose and throat operations.
A. T. BRISTOW — Kings County Hospital — 10 to 12. Surgical operations.
G. McNAUGHTON — Long Island College Hospital — 9 to 12. Gynecological operations.
J. KEPKE — Long Island College Hospital — 2 to 3. Nose and throat clinic.
T. B. SPENCE — Methodist Epsicopal Hospital — 9 to 11. Surgical operations.
W. F. CAMPBELL — Methodist Episcopal Hospital — 11 to 1. Surgical operations.
R. S. FOWLER — Methodist Episcopal Hospital — 2 to 4. Surgical operations.
E. D. FERRIS — Norwegian Hospital — 10 to 12. Gynecological and surgical operations.
J. F. RANKEN — Prospect Heights Hospital — 10 to 12. Gynecological clinic.
E. J. McENTEE — St. Catherine's Hospital — 9 to 12. Surgical operations.
J. MEYER — St. Catherine's Hospital — 3 to 4. Nose and throat operations.
W. S. SIMMONS — St. John's Hospital — 10 to 12. Surgical operations.
J. C. KENNEDY — St. Mary's Hospital — 9 to 12. Surgical operations.
J. M. CLAYLAND — St. Mary's Hospital — 2 to 4. Orthopedic operations.
L. G. BALDWIN — St. Peter's Hospital — 9 to 12. Gynecological operations.
J. F. TODD — St. Peter's Hospital — 11 to 1. Gynecological operations.
C. DUNCAN — Swedish Hospital — 10 to 12. Gynecological operations.
R. J. MORRISON — Williamsburgh Hospital — 9 to 12. Surgical operations.
H. A. WADE — Williamsburgh Hospital — 1 to 3. Gynecological operations.
L. A. McCLELLAND — Williamsburgh Hospital — 3 to 6. Nose and throat operations.
M. L. BODKIN — Williamsburgh Hospital — 2 to 4. Rectal operations.

Wednesday, November 13th

R. W. WESTBROOK — Brooklyn Hospital — 10 to 12. Surgical operations.
N. P. RATHBUN — Brooklyn Hospital Dispensary — 1 to 3. Genito-urinary clinic.
W. S. SHATTUCK — Brooklyn Eye and Ear Hospital — 2 to 4. Ear clinic.
F. DE F. BAILEY — Brooklyn Eye and Ear Hospital — 2. Eye operations.
C. N. COX — Brooklyn Eye and Ear Hospital — 2. Ear operations.
E. MAYNE and J. C. MacEVITT — Coney Island Hospital — 11 to 1. Gynecological operations.

J. P. MURPHY — Coney Island Hospital — 2 to 4. Surgical operations.
C. BURNHAM — Cumberland Street Hospital — 1 to 3. Gynecological operations.
F. WEISBROD — German Hospital — 10 to 1. Gynecological operations.
E. H. FISKE — Holy Family Hospital — 2 to 4. Surgical operations.
W. LINDER — Jewish Hospital — 9 to 12. Surgical operations.
W. L. DUFFIELD — Jewish Hospital — 2 to 4. Surgical operations.
V. H. PENTLARGE — Jewish Hospital — 2 to 4. Genito-urinary clinic.
M. G. WASCH — Jewish Hospital — 2 to 4. X-ray clinic.
H. H. MORTON — Kings County Hospital — 10 to 12. Genito-urinary operations.
J. S. WOOD — Kings County Hospital — 2 to 4. Eye operations.
W. B. BRINSMADE — Long Island College Hospital — 10 to 12. Surgical operations.
J. E. SHEPPARD — Long Island College Hospital — 3 to 4. Ear operations.
J. B. BOGART — Methodist Episcopal Hospital — 9 to 11. Surgical operations.
C. H. GOODRICH and W. A. SHERWOOD — Methodist Episcopal Hospital — 11 to 1. Surgical operations.
R. DURHAM — Methodist Episcopal Hospital — 11. Genito-urinary clinic.
N. P. RATHBUN — Midwood Hospital — 9 to 12. Surgical operations.
L. S. PILCHER and P. M. PILCHER — Pilcher Private Hospital — 9 to 12. Surgical operations.
S. W. PALLISTER — Prospect Heights Hospital — 3 to 5. Surgical operations.
H. B. DELATOUR — St. John's Hospital — 9 to 12. Gynecological and surgical operations.
J. R. KEVIN — St. Mary's Hospital — 9 to 12. Surgical operations.
J. C. MACEVITT — St. Mary's Hospital — 2 to 4. Gynecological operations.
W. M. GARDNER and L. T. JACKMAN — Samaritan Hospital — 2 to 4. Nose and throat operations.
L. A. LYNCH — Swedish Hospital — 10 to 12. Surgical operations.

Thursday, November 14th

R. L. DICKINSON — Brooklyn Hospital — 9 to 12. Gynecological operations.
J. E. JENNINGS — Brooklyn Hospital — 2 to 4. Surgical operations.
A. A. HUSSEY — Brooklyn Hospital — 2 to 4. Obstetrical operations.
F. A. HULST — Brooklyn Hospital — 2 to 4. Pathological laboratory exhibit.
F. C. RAYNOR and W. H. STEERS — Brooklyn Eye and Ear Hospital — 2 to 4. Nose and throat operations.
B. C. COLLINS — Brooklyn Eye and Ear Hospital — 2 to 4. Ear clinic.
W. S. SHATTUCK — Brooklyn Eye and Ear Hospital — 3:30 to 5. Ear operations.
J. S. WOOD and W. H. SNYDER — Brooklyn Eye and Ear Hospital — 2 to 4. Eye clinics.
J. W. INGALLS — Brooklyn Eye and Ear Hospital — 2 to 3. Eye operations.
W. SIMMONS — Brooklyn Eye and Ear Hospital — 3 to 4. Eye operations.
C. E. LACK — Coney Island Hospital — 2 to 4. Surgical operations.
O. S. RITCH — Cumberland Street Hospital — 1 to 3. Surgical operations.
G. H. ILER — Cumberland Street Hospital — 3 to 5. Surgical operations.
J. P. WARBASSE — German Hospital — 10 to 1. Surgical operations.
J. H. DROGE — German Hospital — 2 to 4. Nose and throat operations.
R. L. MOORHEAD — German Hospital — 3 to 4. Nose and throat operations.
W. LINTZ — Hoagland Laboratory — 2 to 4. Pathological laboratory exhibit.
J. MORRIS and V. L. ZIMMERMAN — Holy Family Hospital — 10 to 12. Gynecological operations.
R. SULLIVAN — Holy Family Hospital — 2 to 4. Surgical operations.
G. MCNAUGHTON — Jewish Hospital — 9 to 12. Gynecological and obstetrical operations.
R. M. BEACH — Jewish Hospital — 2 to 4. Obstetrical operations.
J. B. BOGART — Kings County Hospital — 10 to 12. Surgical operations.
A. MURRAY — Kings County Hospital — 2 to 4. Pathological laboratory exhibit. Demonstration of projectoscope.
J. O. POLAK, F. C. HOLDEN and N. P. GEIS — Long Island College Hospital — 8 to 12. Gynecological and obstetrical operations.
H. H. MORTON — Long Island College Hospital — 10 to 12. Genito-urinary operations.
T. R. FRENCH, W. F. DUDLEY and P. H. STURGES — Long Island College Hospital — 3:30. Nose and throat operations (ether in upright position).
J. M. VANCOTT — Long Island College and Hoagland Laboratory — 2 to 4. Pathological laboratory exhibit.
T. B. SPENCE — Methodist Episcopal Hospital — 9 to 11. Surgical operations.
C. H. GOODRICH and W. F. CAMPBELL — Methodist Episcopal Hospital — 11 to 1. Surgical operations.
WALTER TRUSLOW — Methodist Episcopal Hospital — 2 to 3. Orthopedic clinic.
H. B. DELATOUR — Norwegian Hospital — 9 to 11. Gynecological and surgical operations.
E. D. FERRIS — Norwegian Hospital — 10 to 12. Gynecological and surgical operations.
J. F. RANKEN — Prospect Heights Hospital — 10 to 12. Gynecological clinic.
N. ROBINSON — Prospect Heights Hospital — 3 to 5. Surgical operations.
P. HUGHES — St. Catherine's Hospital — 9 to 12. Surgical operations.
P. M. PILCHER — St. John's Hospital — 10 to 12. Genito-urinary clinic.
A. T. BRISTOW — St. John's Hospital — 10 to 1. Gynecological and surgical operations.
E. A. PARKER — St. Mary's Hospital — 9 to 12. Surgical operations.
L. G. BALDWIN — St. Peter's Hospital — 9 to 12. Gynecological operations.
J. F. TODD — St. Peter's Hospital — 11 to 1. Gynecological operations.
A. M. JUDD — Swedish Hospital — 10 to 12. Gynecological and obstetrical operations.
E. A. PARKER — Williamsburgh Hospital — 2 to 4. Surgical operations.
J. B. DOWD — Williamsburgh Hospital — 2 to 4. Gynecological operations.

Friday, November 15th

W. C. WOOD — Brooklyn Hospital — 10 to 12. Surgical operations.

N. P. RATHBUN — Brooklyn Hospital — 1 to 3. Genito-urinary clinic. New Dispensary.

R. L. DICKINSON — Brooklyn Hospital — 2 to 5. Gynecological operations.

H. ARROWSMITH and F. L. TUCKER — Brooklyn Eye and Ear Hospital — 1:30 to 3:30. Nose and throat operations.

H. H. WAUGH and F. DE F. BAILEY — Brooklyn Eye and Ear Hospital — 2 to 4. Eye clinics.

J. D. RUSHMORE — Brooklyn Eye and Ear Hospital — 2. to 3 Eye operations.

W. SIMMONS — Brooklyn Eye and Ear Hospital — 3 to 4. Eye operations.

W. C. BRAISLIN, C. N. COX, W. S. SHATTUCK and H. A. ALDERTON — Brooklyn Eye and Ear Hospital — 2 to 4. Ear clinics.

S. LUTZ — Brooklyn Eye and Ear Hospital — 3:30 to 5. Ear operations.

W. H. PIERSON — Cumberland Street Hospital — 1 to 3. Gynecological operations.

J. F. RANKEN — Cumberland Street Hospital — 3 to 5. Gynecological operations.

H. C. ALLEN and T. A. BUYS — Cumberland Street Hospital — 3 to 5. Obstetrical operations.

R. S. FOWLER — German Hospital — 10 to 1. Surgical operations.

M. G. WASCH — Jewish Hospital — 1 to 2:30. X-Ray clinic.

W. LINDER — Jewish Hospital — 2 to 4. Surgical operations.

V. H. PENTLARGE — Jewish Hospital — 2 to 4. Genito-urinary clinic.

J. M. WINFIELD — Kings County Hospital — 10 to 12. Syphilis and cancer clinic.

C. EASTMOND — Kings County Hospital — 11 to 12. X-Ray clinic.

CHARLES D. NAPIER and WALTER TRUSLOW — Kings County Hospital — 3 to 5. Orthopedic operations.

A. T. BRISTOW — Long Island College Hospital — 10 to 12. Surgical operations.

J. S. READ, P. M. PILCHER, W. R. ISZARD, B. HARRIS and R. DURHAM — Long Island College Hospital — 2 to 4. Genito-urinary clinics.

J. B. BOGART — Methodist Episcopal Hospital — 9 to 11. Surgical operations.

W. A. SHERWOOD — Methodist Episcopal Hospital — 11 to 1. Surgical operations.

C. DUNCAN — Midwood Hospital — 9 to 12. Surgical operations.

L. S. PILCHER and P. M. PILCHER — Pilcher Private Hospital — 9 to 12. Surgical operations.

J. F. RANKEN — Prospect Heights Hospital — 10 to 12. Gynecological clinic.

M. FIGUEIRA — St. Catherine's Hospital — 9 to 12. Surgical operations.

J. G. WILLIAMS — St. Catherine's Hospital — 11 to 12. X-Ray clinic.

W. B. BRINSMADE — St. John's Hospital — 9 to 12. Gynecological and surgical operations.

O. A. GORDON — St. Mary's Hospital — 9 to 12. Surgical operations.

J. P. GLYNN — St. Mary's Hospital — 2 to 4. Gynecological operations.

W. S. SIMMONS — Swedish Hospital — 10 to 12. Surgical operations.

J. G. DICKERT — Williamsburgh Hospital — 10 to 12. Surgical clinic.

C. A. GORDON — Williamsburgh Hospital — 2 to 4. Gynecological operations.

Saturday, November 16th

R. W. WESTBROOK — Brooklyn Hospital — 10 to 12. Surgical operations.

B. C. COLLINS — Brooklyn Eye and Ear Hospital — 2 to 4. Ear operations.

D. W. MEYER — Brooklyn Eye and Ear Hospital — 2 to 4. Eye clinic.

J. S. WOOD — Brooklyn Eye and Ear Hospital — 3. Eye operations.

H. D. SCHENCK — Cumberland Street Hospital —2 to 3. Eye operations.

F. WEISBROD — German Hospital — 10 to 1. Gynecological operations.

A. M. JUDD — Jewish Hospital — 9 to 12. Gynecological operations.

O. P. HUMPSTONE — Jewish Hospital — 2 to 4. Obstetrical operations.

C. BARBER — Kings County Hospital — 9 to 11. Surgical operations.

H. E. FRASER — Kings County Hospital — 2 to 4. Genito-urinary operations.

E. PALMER, C. R. HYDE and W. P. POOL — Long Island College Hospital — 9 to 12. Gynecological operations.

T. B. SPENCE — Methodist Episcopal Hospital — 9 to 11. Surgical operations.

W. F. CAMPBELL — Methodist Episcopal Hospital — 11 to 1. Surgical operations.

R. S. FOWLER — Methodist Episcopal Hospital — 2 to 4. Surgical operations.

J. A. LEE — St. Mary's Hospital — 9 to 12. Surgical operations.

W. F. CAMPBELL — Trinity Hospital — 2 to 5. Surgical operations.

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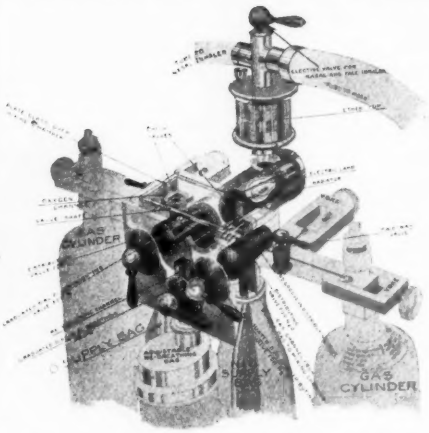

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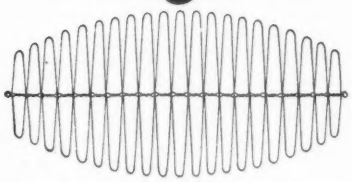

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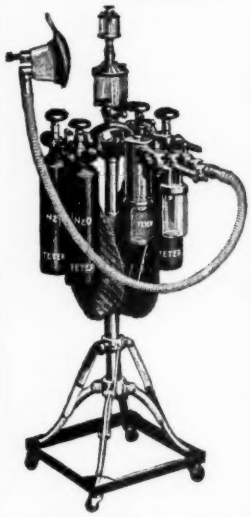

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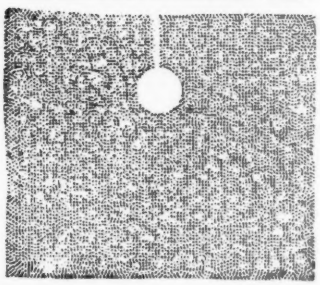

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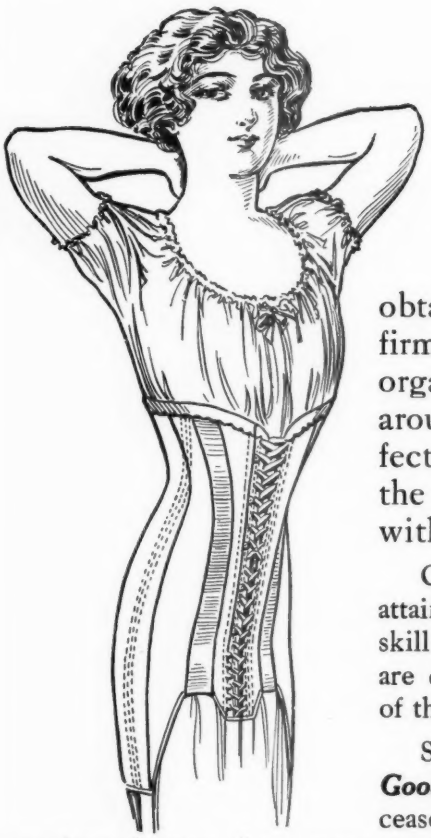

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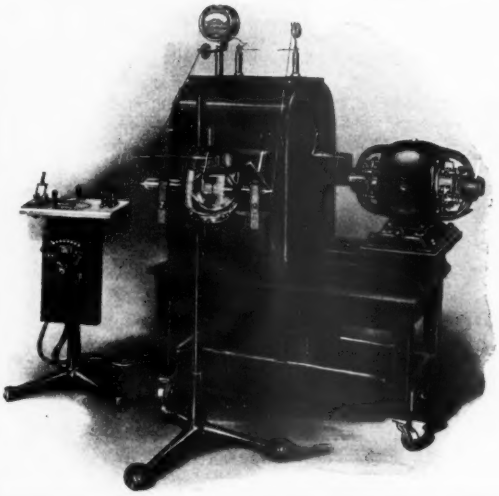

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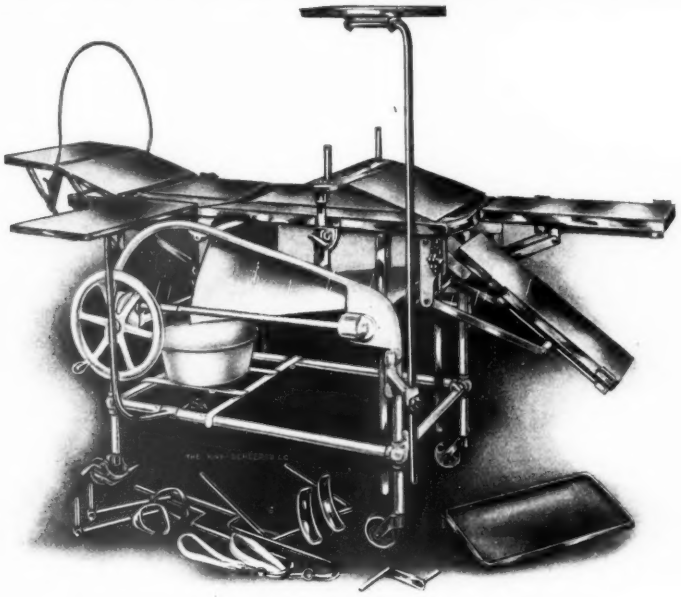

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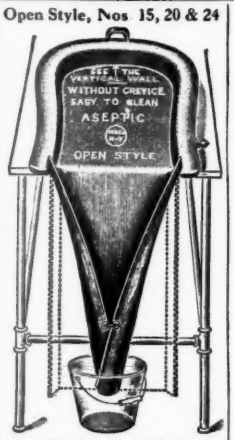

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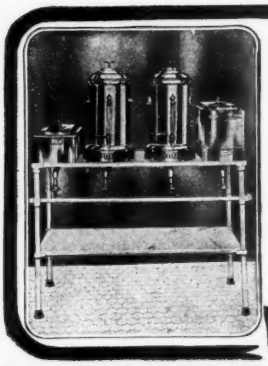

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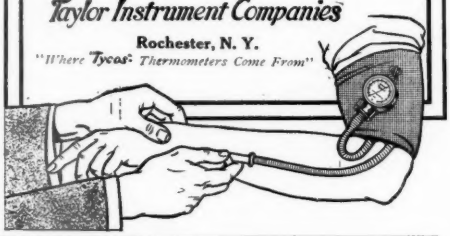

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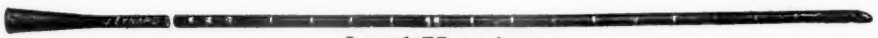

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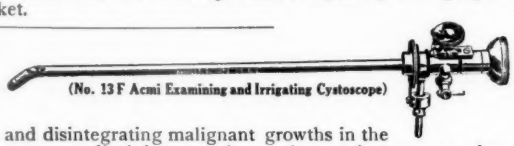
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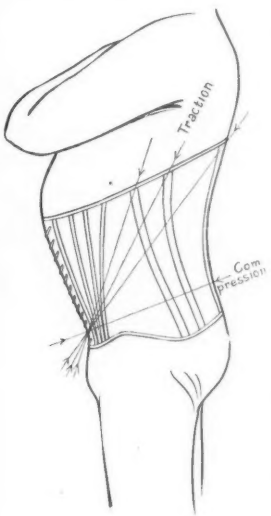

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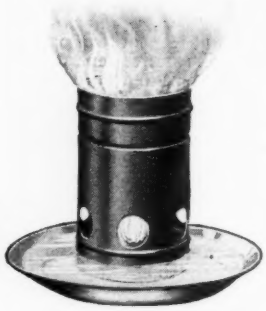

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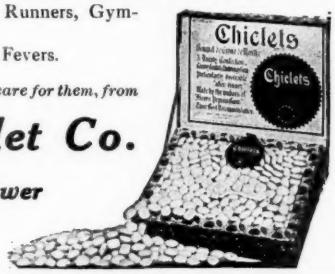

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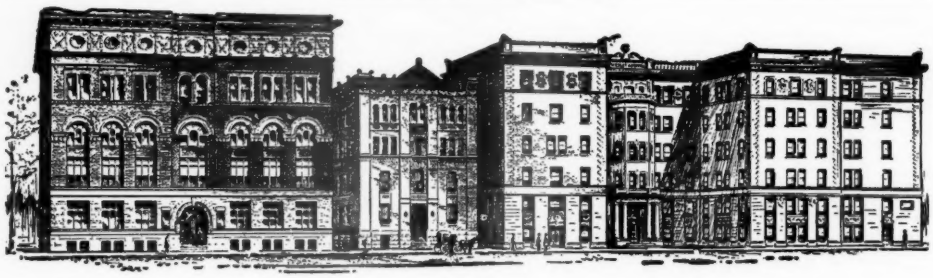

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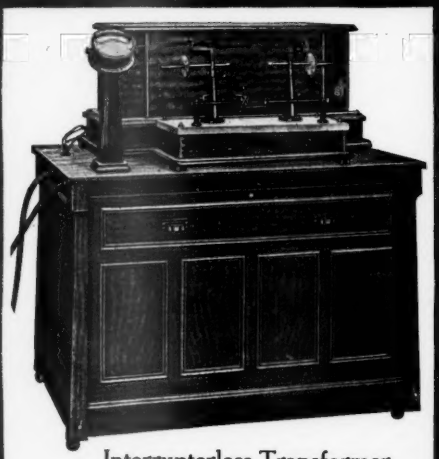

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